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REVIEW
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HILF (H. H.). **Zum Rindentod der Pappel in Norddeutschland.** [On bark necrosis of Poplar in north Germany.]—*Holzzucht*, 9, 5, pp. 29–30, 1955.

Introducing E. Franken's contribution to the study of meteorological conditions in relation to the epiphytotic of poplar bark canker (*Dothichiza populea*) in the Hamburg district of north Germany in the spring of 1955 [36, p. 288], the writer summarizes the available information on the existing position of the disease in that area. A crown die-back of *Populus italica*, now ubiquitous in Schleswig-Holstein, also points to the operation during dormancy of climatic factors which have been in abeyance for the past 70 years.

EICHBAUM (K.). **Zum Pappelrindentod–Dothichiza populea.** [On Poplar bark necrosis —*Dothichiza populea*.]—*Allg. Forstz.*, 11, 27–28, pp. 352–354, 3 figs., 1956.

The problem of poplar bark canker (*Dothichiza populea*) is stated to be the object of intensive studies in three institutes in Federal Germany [see preceding abstract], in the central region of the country, and abroad. Information is presented from the Bonn silvicultural district on the symptoms and biology of the pathogen in relation to seasonal factors and on the conditions predisposing the host to infection. The history of the disease is briefly outlined, beginning with the first description of the fungus in France in 1884 and culminating in the German epiphytotic of 1955. In 1956 infection was confined within tolerable limits.

GREMMEN (J.). **Een blad- en twijgziekte van Populieren veroorzaakt door Venturia tremulae en Venturia populina.** [A leaf and twig disease of Poplars caused by *Venturia tremulae* and *Venturia populina*.]—*Tijdschr. PlZiekt.*, 62, 5, pp. 236–242, 1 pl., 2 figs., 1956. [English summary.]

During the last three years two- to six-year-old nursery aspens and hybrids of *Populus tremula* × *P. alba* at the Forest Research Station, Wageningen, the Netherlands, have been attacked by *Venturia tremulae* [cf. 30, pp. 202, 637], which was particularly severe in the spring of 1955, causing profuse black spotting and ultimate death of the leaves. Perithecia were not observed in nature and the small, black bodies produced on malt agar failed to mature. Overwintering was effected by means of the mycelium in the previous year's twigs, the first stromata, 80 to 150 μ in diameter, appearing on 4th May and giving rise to numerous conidia. Sporulation continued throughout the spring and summer.

V. populina [31, p. 91] has not yet been found in the Netherlands, but it occurs in Germany (*Allg. Forstz.*, 8, pp. 425–427, 1953) and south Denmark, where it was collected in 1952, *P. berolinensis* being the host in both countries. On malt agar the

mycelium of *V. populina* (from Germany) produced perithecia in the course of 80 to 150 days after a period from December to March at 0° to 5° C.

Some indications of resistance to *V. tremulae* have been observed among certain hybrid poplars and aspens at the Forest Research Station. Dead twigs should be removed to prevent mycelial overwintering and consequent development of stromata in the spring.

WATERMAN (ALMA M.). **Verticillium wilt of Yellow-Poplar.**—*Plant Dis. Reptr*, 40, 4, pp. 349–350, 1956.

Verticillium albo-atrum [35, p. 450] was isolated at Milford, Connecticut, from wilted branches of a tulip tree (*Liriodendron tulipifera*). This appears to be a new host record. Other tulip trees in the vicinity and garden plants, maples [*Acer* spp.], and elms were free from infection. The affected tree was growing under unfavourable conditions in soil frequently saturated with water in the spring. The fungus was successfully wound-inoculated to young tulip trees.

RENNERFELT (E.). **The natural resistance to decay of certain conifers.**—*Friesia*, 5, 3–5, pp. 361–365, 1 fig., 1 graph, 1956.

Tested by Leutritz's method [35, p. 857] at the Forest Research Institute, Stockholm, the heartwoods of *Actinostrobus pyramidalis*, *Cedrus deodara*, *Chamaecyparis nootkatensis*, *C. pisifera*, *Cupressus lawsoniana*, *Libocedrus bidwillii*, *L. chilensis*, *L. decurrens*, *Podocarpus totara*, *Sequoia sempervirens*, *Thuja plicata*, and *Widdringtonia whytei* were the most resistant of 22 conifers to infection by *Coniophora puteana*, *Lentinus lepideus*, and *Poria vaporaria* [35, p. 58], though in a few cases one of the three species, mostly *C. puteana*, proved capable of attack. A moderate to low degree of resistance characterized *Agathis alba*, *Araucaria imbricata*, *Juniperus communis*, larch, pine (*Pinus sylvestris*), and yew.

Information already presented on the fungicidal chemical compounds in the heartwood of resistant species [loc. cit.] is recapitulated. Resistance may also be strengthened by the abundance of oil in the wood, e.g., of *Cedrus deodara*, *Chamaecyparis pisifera*, *Libocedrus chilensis* (also protected by its β-thujaplicin content of not less than 1 per cent.), and *W. whytei* (rendered water-repellent).

ROBAK (H.). **Some fungi occurring on died-back tops and branches of Picea abies and Abies spp. in western Norway.**—*Friesia*, 5, 3–5, pp. 366–389, 6 figs., 1 map, 1956.

This is a critically annotated list of fungi collected by the author of recent years on necrotic spruce and *Abies* tops and branches in western Norway. They comprise a hymenomycete with sterile fructifications, almost certainly *Corticium evolvens* [25, p. 146], (?) *Stereum sanguinolentum*, *Cenangium ferruginosum* [34, p. 325] (believed to be the first record of this fungus on spruce), *Coniothyrium corticola* (syn. *C. rostellatum*), *C. dispersellum*, *Cytospora abietis* [22, p. 1], *C. curreyi*, *C. mougeotii*, *Dothichiza Sclerophoma pithyophila* [32, p. 598], *S. entoxylina* [9, p. 76], *Phomopsis conorum* [10, p. 278], *P. montanensis* [loc. cit.], *P. pseudotsugae* [34, p. 419], *Zythia pinastri*, *Hormococcus conorum* (Sacc. & Roum.) n.comb. (syn. *Sirococcus conorum*), *Ascochyta piniperda* [26, p. 223], *Crumenula abietina* (found only in the pycnidial state) [30, p. 202; 34, p. 325], *Hendersonia abietis*, *Camarosporium strobilinum*, *Robakia arctica*, *Coryneum juniperi*, *Cryptosporiopsis diversispora*, *Nectria cinnabarina* (occurring exclusively in its conidial state) [cf. 30, p. 203], *Fusarium* sp. (? of the *avenaceum* complex), and *Sirodesmium ellipsoideum* n.sp. ad int., all on spruce; *Nectria cucurbitula* [cf. 35, p. 562], *Sclerophoma pithyophila*, *Myxocyclus cenangioides* (syn. *Camarosporium abietis*), *Cryptosporiopsis*

diversispora, and *C. balsameae* on *A.* spp.; and *Pestalotia sabinae* on *Pseudotsuga taxifolia* f. *viridis*.

Glaser (T.) & Sosna (Z.). **Badania porównawcze huby korzeniowej (Fomes annosus Fr.) pochodzącej z Sosny, Świerka i Brzozy na sztucznych pożywkach.** [Comparative studies of the root fungus (*Fomes annosus* Fr.) isolated from Pine, Spruce, and Birch on artificial media.]—*Acta Soc. Bot. Polon.*, 25, 2, pp. 285–303, 2 figs., 1 diag., 1 graph, 1956. [English summary.]

Preliminary laboratory experiments on *Fomes annosus* collected in 1953 from pine, spruce, and birch at Poznań, Poland [14, p. 663; 32, p. 44], showed that the growth rate on malt and potato-dextrose agar media was highest in the birch isolates and lowest in those from pine. The latter caused the greatest loss of weight in all the wood samples tested. No correlation was established between weight loss, time of appearance of fruiting bodies on the wood samples, and growth rate on the agar media or on wood (highest for the spruce isolate and lowest for the birch on all samples).

Wright (E.) & Isaac (L. A.). **Decay following logging injury to Western Hemlock, Sitka Spruce, and true Firs.**—*Tech. Bull. U.S. Dep. Agric.* 1148, 34 pp., 12 figs., 1 diag., 4 graphs, 1 map, 1956.

In studies on timber decay after logging injury [cf. 27, p. 105] and sunscald [cf. 23, p. 418] in western Washington and Oregon, 20 different fungi were found causing rot on western hemlock (*Tsuga heterophylla*) [cf. 29, p. 392], eight on the true firs, grand fir (*Abies grandis*), and Pacific silver fir (*A. amabilis*) [loc. cit.], and 11 on Sitka spruce (*Picea sitchensis*) [cf. 27, p. 547]. A total of 27 species was identified.

Fomes annosus [26, p. 321], causing root and butt rot, with *Stereum sanguinolentum* [cf. 14, p. 728] and other *S.* species second, were commonest on western hemlock and the true firs, while on Sitka spruce *F. pinicola* was found in 34 per cent. of the lesions, *S.* spp. in 15, and *Lentinus kauffmanii* [27, p. 547] in 11. The decay average in scars for western hemlock for the region was 63 per cent., Sitka spruce on the coast had 58, and true firs east of the Coast Range 90. Less than half the lesions of 1 sq. foot or less, but all those larger than 7, were infected. Excessive cutting and windfall not only spread decay in residual trees but may threaten the entire stand. Sunscald, hitherto rare, was prevalent on exposed hemlock trunks, especially when stands were heavily cut.

The rate of decay of scars was fastest during the first three years and decreased with the increase in the volume of decay. Compared with western hemlock the rate of decay for Sitka spruce was slower at first but faster when decay was established. Data are given regarding the probable occurrence of decay and its rate of spread after injury as a guide to cutting practice.

Scurti (J. C.). **Sulla degradazione dei legni delle piante forestali e da frutto per azione dell' Armillaria mellea.** [On the destruction of the woods of forest and fruit trees by the action of *Armillaria mellea*.]—*Ann. Sper. agr.*, N.S., 10, 2, pp. 495–512, 1956. [English summary.]

In studies conducted at the Experimental Laboratory of Phytopathology, Turin, on the effects of *Armillaria mellea* in culture on wood extracts of fruit and forest trees, it was found that after six or 12 months' growth the fungus destroyed mainly cellulose and the hemicelluloses. In beech, mulberry, fir (*Abies excelsa*), and walnut, cellulose was heavily attacked, while destruction was much less in cherry, apple, and chestnut (*Castanea vesca*), and less still in *Robinia pseudoacacia* and poplar (*Populus alba*), breakdown of hemicellulose usually running parallel. Lignin was undamaged or only very slightly affected [cf. 34, p. 816], this result being confirmed by *in vitro* experiments on lignin in nutrient solutions.

Wagenführ (R.) & Steiger (A.). **Pilze auf Bauholz.** [Fungi on building timber.] —64 pp., 48 figs., Wittenberg-Lutherstadt, A. Ziemsen Verlag, 1956. DM. 3.75.

This booklet is intended to provide the interested lay public with a practical guide to the fungi commonly causing damage to worked or stored timber. Brief introductory chapters are followed by full descriptions of the fungi, including microscopical characters and the type of damage produced, and recommendations for control. The photographs are of high quality.

Öhlmann (J.). **Holzschutz im Bergbau (I).** [Timber preservation in the mining industry (I).]—*Bergbautech.*, 6, 6, pp. 323–329, 4 figs., 1 graph, 1956.

Useful information, based on personal observations and a study of 17 contributions to the relevant literature, is presented on timber preservation in German mines, where decay may be due to mechanical and chemical influences as well as to micro-organisms, mostly fungi, i.e., *Merulius domesticus* [*M. lacrymans*], *Coniophora cerebella* [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*] (all superficial), and *Lentinus* and *Lenzites* spp. [including *Lentinus lepideus* and *Lenzites saepiaria*], which penetrate the wood immediately after spore germination.

A list is given of preservatives officially approved for application in the German Democratic Republic, with explanatory comments, and the various methods of impregnation in current use are briefly described.

In a concluding note on the economics of preservation it is stated that even primitive methods like painting, spraying, and dipping extend the service life of mine timbers by 50 per cent., while correspondingly longer periods of usefulness may be ensured by the application of more up-to-date procedures, such as the hot and cold bath or protracted immersion (two to three times the usual) and immersion at boiler pressure (at least three to five times). The last-named is the most expensive method, but calculations have shown it to be profitable even to procure an extension of only 20 per cent. in the duration of service life.

Dry rot—causes, remedy and prevention. Preservative treatment of timber for estate, farm and garden use. The case for preservative treatment of timber.—Wood Preservation Leaflets (British Wood Preserving Association, 6 Southampton Place, W.C. 1) 1, 4 pp., 1 fig.; 2, 3 pp., 2 figs.; 3, 4 pp. [? 1956].

The first of these useful popular pamphlets reviews the symptoms, sources of infection, and practical aspects of control of dry rot (*Merulius lacrymans*) of timber [35, p. 856]. The other two discuss the uses and types of wood preservatives, methods of application, and choice of treatment, the third referring also to the economic aspects of such procedure.

Hudson (M. S.) & Henriksson (S. T.). **The oscillating pressure method of wood impregnation.**—*For. Prod. J.*, 6, 10, pp. 381–386, 3 figs., 1 diag., 1 graph, 1956.

A method for the preservative impregnation of woods resistant to treatment by the usual pressure processes is fully described, with a discussion of the underlying physical principles involved. It is based on rapid cycling of pressure and vacuum to secure penetration of preservative salts in aqueous solution into unseasoned wood. Pressure is oscillated [34, p. 689] between 115 lb. sq. in. and 28 in. vacuum, with the interval between cycles gradually lengthened from one to six minutes.

The composition (in percentages) of the modifications of Boliden salt [34, pp. 559, 690, *et passim*] principally used in Sweden for treatment by fluctuating pressure is as follows, for S-25: 36 arsenic oxide, 23·5 chromium oxide, 11·5 zinc oxide, 3·8 copper oxide, and 25·2 water, the corresponding figures for K-33 being 34, 26·6, 0, 14·8, and 24·6, respectively. In the United States the over-all cost of preservation by the alternating pressure method would be about $25 per 1,000 board ft.

Goto (M.). **A rot disease of Cabbage due to Pseudomonas marginalis.**—*Agric. & Hort., Tokyo*, 31, 11; pp. 1547–1548, 1956. [Japanese.]

A bacterial rot of cabbage differing in some respects from that caused by *Erwinia aroideae* occurs in Shizuoka Prefecture, Japan. The disease was found to be due to *Pseudomonas marginalis* [36, p. 192].

Eddins (A. H.). **Control of downy mildew of Cabbage with fungicides.**—*Bull. Fla agric. Exp. Sta.* 543, 23 pp., 2 figs., 1956.

This publication describes fungicide tests at Hastings, Florida, from 1940 to 1953 for the control of downy mildew (*Peronospora parasitica*) of cabbage in plant beds and on heading plants. There is a summary of recommendations, most of which have already been noticed [34, p. 581]. The danger of injuring young plants by over-treatment with chloranil is emphasized. Nabam (2 qt. plus 1 lb. zinc sulphate in 100 gals. water), 50 per cent. chloranil (2 lb. in 100 gals.), 5 per cent. chloranil dust, or 6·5 per cent. zineb dust are recommended for control on heading cabbage, 100 to 150 gals. spray or 30 to 35 lb. dust to be applied every six or seven days from one to three weeks before harvest until all the marketable heads are cut.

Natti (J. J.). **Influence of Cauliflower mosaic and Turnip mosaic viruses on yields of Cabbage in New York State.**—*Plant Dis. Reptr*, 40, 7, pp. 591–595, 1956.

In experimental plots at the Department of Plant Pathology, New York State Agricultural Experiment Station, Geneva, cabbage plants inoculated in the seed-bed or early in the season with cauliflower mosaic and turnip mosaic viruses [33, p. 459] yielded 50 to 75 per cent. less than healthy plants or those inoculated late. In commercial plantings infection is generally late and does not affect yield. The absence of or very slight infection early in the season is probably related to the availability of inoculum. In nature the viruses must overwinter in biennial or perennial hosts, which either occur sparsely or are not frequented by insect vectors.

Partsch (G.). **Molybdänmangel an Blumenkohl in Deutschland.** [Molybdenum deficiency in Cauliflower in Germany.]—Dissertation aus dem Institut für Phytopathologie der Justus-Liebig-Hochschule, Giessen, 120 pp., 1955. [Abs. in *Z. PflKrankh.*, 63, 11, pp. 650–651, 1956.]

Further information is presented on molybdenum deficiency in cauliflower and its control in Germany [35, p. 410]. The influence of various soil types on the uptake of the element was investigated in an extensive series of experiments. The results showed that on heavy soils, rich in colloids, it is necessary to apply sodium molybdate at a dosage of 4 to 6 kg. per ha., whereas on light ones 2 kg. suffices to prevent damage from the deficiency. Absorption is promoted, moreover, by adjustment of the soil reaction to the alkaline range, though amendments with lime alone were not altogether successful in numerous pot and field tests.

Flora Blanka and Frankfurter Riesen are among the slow-growing, robust varieties capable of making normal growth under conditions of extreme molybdenum deficiency, while Erfurter Amrun does not suffer unduly from a shortage. Symptoms of molybdenum deficiency were found to be enhanced by the inclusion of ammonium sulphate in the fertilizer. Liberal applications of sodium molybdate (0·8 to 1 gm. per sq. m.) to the seed-bed effectively prevented the development of injury at a later stage.

Haavisto (M.). **Typhula betae Rostr. on Winter Turnip Rape.**—*Maataloust. Aikakausk.*, 28, pp. 105–108, 3 figs., 1956. [Finnish summary.]

The species of *Typhula* responsible for damage to winter turnip rape in Finland

[36, p. 7] has been identified at the Agricultural Research Centre, Tikkurila, as *T. betae* and is briefly described. Vang's merging of this species with *T. brassicae* [25, p. 217] is rejected on the grounds of non-compliance with the international rules of nomenclature.

Schlösser (E. R.). **Über den Einfluß des Gelbsuchtvirus auf eine nachfolgende Cercospora-Infektion bei Zuckerrüben.** [On the influence of the yellows virus on a subsequent *Cercospora* infection of Sugar Beets.]—*Zucker*, 9, 24, pp. 589–592, 1956.

The results of field experiments from 1950 to 1954 at the Kleinwanzleben Plant Breeding Company, Einbeck, Hanover, Germany, showed that resistance to *Cercospora* [*beticola*] in sugar beet was largely overcome by inoculation with the 'Friesland' isolate of the yellows virus in mid-June, using *Myzodes* [*Myzus*] *persicae* as a vector [36, p. 227].

In 1955 inoculation with a mixture of 'Friesland' yellows and a moderately severe isolate of beet mosaic virus [loc. cit.] on 12th July, and with 'Friesland' alone on the 17th, caused an appreciable breakdown in the normal resistance to *C. beticola* of the tetraploid CRY and the diploid CR varieties, while the susceptible E and N suffered heavy damage. The average beet reduction per ha. in plots inoculated with the yellows virus and (a week to a fortnight later) with *C. beticola* was 30 to 50 doppelzentner [1 dz. = approximately 2 cwt.] (5 to 10 per cent.) and with a mixture of yellows and mosaic, followed by leaf spot, 100 to 150 (25 to 40), as compared with infection by the fungus alone. Yellows and leaf spot reduced polarization values from 0·35 to 1·5 (5 to 10 per cent.) and the mixture of viruses and the fungus by 1·4 to 2·4 (10 to 15). The effects of yellows and leaf spot on foliage yield were inconsistent, but the two viruses and the fungus together were responsible for uniformly heavy losses.

Yarwood (C. E.). **Heat-induced susceptibility of Beans to some viruses and fungi.** —*Phytopathology*, 46, 9, pp. 523–525, 1956.

Experiments at the University of California, Berkeley, showed that heat treatment could increase the susceptibility of bean (*Phaseolus vulgaris*) leaves to a number of viruses [cf. 31, p. 474; 32, p. 538] and to some fungi. Following immersion in hot water for a few seconds typical immersion quotients (number of lesions on a heated leaf divided by the number on a control leaf) were: for tobacco mosaic virus, 7; for [tomato] spotted wilt virus, 2·3; for peach yellow bud mosaic virus, 6·2; for *Colletotrichum lindemuthianum*, 11·6; and for *Uromyces phaseoli* [*U. appendiculatus*], 1·5.

Optimum temperatures and periods of heating were not clearly determined. Following exposure of bean leaves at 40° C. for 100 to 600 secs. before inoculation with tobacco mosaic virus, maximum increased infection was secured after 360 secs.; at 45°, 50°, and 55°, the corresponding periods were 60, 10, and 1 secs.

This increased susceptibility to tobacco mosaic virus lasted for at least three days. Cold or hot water treatments immediately after inoculation reduced lesion numbers, but applied several hours later often caused an increase, and also generally increased their size.

Suspension of the tobacco mosaic virus inoculum in 1 per cent. potassium hydrogen phosphate generally lessened infection on heat-treated leaves, but heat treatments after inoculation gave larger lesions with such inoculum. Inoculated leaves dried slowly or incubated in a moist chamber contracted more infection than those dried quickly or exposed to dry air [cf. 35, p. 865].

Hosts other than beans have not yet been found to react in this way to viruses after heat treatment, but heating before inoculation markedly increased infection of sunflower by rust (*Puccinia helianthi*).

Mitchell (J. W.), Preston (W. H.), & Beal (J. M.). **Stem inoculation of Pinto Bean with southern Bean mosaic virus, a promising method for use in screening chemicals for antiviral activity.**—*Phytopathology*, 46, 9, pp. 479–485, 17 figs., 1 diag., 1956.

At the Horticultural Crops Research Branch, Beltsville, Maryland, Pinto bean (*Phaseolus vulgaris*) plants were inoculated with southern bean mosaic virus when the first trifoliate leaf was beginning to unfold. About 1 mg. carborundum was added to each of three drops of inoculum placed one above the other beneath the cotyledons and 5 mm. apart. The underlying tissue was then scarified and immediately washed with tap water. In at least 95 per cent. of the plants thus inoculated dark brown lesions developed within four to five days.

Information on the potential use of the foregoing procedure to detect the inhibitory effect of chemicals on virus multiplication was gained by close studies of the path of upward and downward movement, which was indicated by the formation of internal (but externally visible) brown streaks above and below the initial lesions. The three techniques used for detecting the locality of the virus were (1) sectioning of material fixed in Navashin's solution and stained with a modified triple stain; (2) triphenyltetrazolium chloride colour-reaction tests [35, p. 583]; and (3) the inoculation of indicator plants with diluted sap from frozen dissected tissues. From observations on the inoculated area and neighbouring epidermis and cortex, the discoloured portion and the remainder of the pericycle and phloem, and the stele, the virus appeared to enter the injured epidermal or outermost cortical cells and then move slowly inwards during the next few days. Once it reached the phloem-pericycle tissues movement was accelerated.

By these means the absorption, translocation, and anti-viral activity of chemicals, carried in lanolin and placed at, near, or some distance away from the site of inoculation, could be evaluated. In repeated tests over a two-year period thiouracil and noformicin [34, p. 702], applied at about 17 μgm. per inoculated area, reduced lesion production by approximately 70 and 95 per cent., respectively.

Yarwood (C. E.). **Therapeutic action of sulfur for powdery mildews and rusts.**—*Ex* Therapy of fungus diseases. An international symposium. Boston and Toronto, Little, Brown, & Co., pp. 130–135, 3 graphs, 1955. [Received October, 1956.]

In this contribution to an international symposium held at the University of California, Los Angeles, in June, 1955, the author gives the results of experiments on the selective toxicity and selective accumulation of sulphur [cf. 28, p. 106; 34, p. 473] in relation to powdery mildew (*Erysiphe polygoni*) and rust (*Uromyces phaseoli*) [*U. appendiculatus*] of bean (*Phaseolus vulgaris*).

If part of the sulphur is radioactive the calculated amount absorbed may be correlated with host and fungus response [loc. cit.]. Accumulation in leaves inoculated with *U. appendiculatus* was up to eight times as great as in healthy ones, but no selective accumulation (Albert, A. Selective toxicity with special reference to chemotherapy. New York, Wiley, 1951) was observed in *E. polygoni* infections. Accumulation of sulphur by the rust uredospores was also much greater than by the mildew conidia. It is therefore tentatively concluded that sulphur therapy of *U. appendiculatus* is by selective accumulation and of *E. polygoni* by selective toxicity.

Yerkes (W. D.) & Ortiz (M. T.). **New races of Colletotrichum lindemuthianum in Mexico.**—*Phytopathology*, 46, 10, pp. 564–567, 3 figs., 1956.

Investigations under the Rockefeller Foundation Agricultural Program, Mexico, showed that the susceptibility of previously resistant varieties of bean [*Phaseolus vulgaris*] to *Colletotrichum lindemuthianum* [31, p. 372; 36, p. 159] in

Mexico was due to the appearance of a number of new races of the fungus. Using five Mexican bean varieties and three standard American ones the presence of ten new races (MA-1 to MA-10) was demonstrated. The believed origin of the bean in this part of the world may account for the numerous races of its pathogen there. The local bean lines, however, contain resistance factors, and the production of further resistant varieties should be practicable.

HUBBELING (N.). **Nieuwe aspecten omtrent de ziekteresistentie bij Bonen.** [New aspects of disease resistance in Beans.]—*Landbouwk. Tijdschr., Wageningen*, 68, 6, pp. 596–597, 1956.

Reporting to the 47th meeting of the Plant Breeding Study Circle on 30th November, 1955, the author traced the history of breeding for resistance to diseases of bean (*Phaseolus* [*vulgaris*]) in the Netherlands [35, p. 649], which began in 1940 with investigations on the inheritance of roll mosaic [bean mosaic virus: 34, p. 567; 35, p. 262] and halo blight [*Pseudomonas medicaginis* f. sp. *phaseolicola*: loc. cit.]. Some five years later it was found that the progenitors conferring resistance to these diseases failed to transmit a comparable reaction to stipple streak [tobacco necrosis virus; loc. cit.] and 'spot disease'. Black vascular disease [bean mosaic virus] and rust [*Uromyces appendiculatus*: loc. cit.] then required consideration, while the grouping of physiologic races of *Colletotrichum lindemuthianum* was started in 1955 [35, p. 572].

The number of resistance factors detected already exceeds 20. Hybridization is complicated by the fact that susceptibility is usually dominant and it is virtually impracticable to secure a combination of more than five recessive factors, though the use of the line with the maximum number of resistance genes as the back-cross parent will occasionally achieve the desired effect.

Tests for resistance should be conducted as early as possible in the growth of the plant so that back-crossing can be undertaken in good time. Such tests can be made on seedlings for tobacco necrosis virus, halo blight, 'spot disease', and *C. lindemuthianum*. Resistance to bean mosaic is generally best determined in the field in proximity to rows of beans infected through the seed, and to *Phaseolus* virus 2 [bean yellow mosaic virus] by using gladioli [35, p. 262].

GORLENKO (M. V.) & SHNEIDER (Y. I.). Оздоровление семян Фасоли от бактериоза путем летних посевов. [Recovery of Bean seeds from bacteriosis through summer sowing.]—Докл. Акад. сельскохоз. Наук Ленина. [*Rep. Lenin Acad. agric. Sci.* = *Proc. Lenin Acad. agric. Sci.*], 21, 8, pp. 38–41, 1956.

Experiments carried out from 1952 to 1955 at the Slav Base of the Pan-Soviet Scientific Research Institute for Plant Protection, Krasnodar, U.S.S.R., showed that sowing beans [*Phaseolus vulgaris*] in summer, provided the soil is sufficiently moist, increased vigour considerably and decreased the incidence of all forms of bacteriosis (*Xanthomonas phaseoli*) [34, p. 16]. The first fortnight in June is considered the most favourable time for the Krasnodar region. In trials in 1954 and 1955 with the bean variety Krasnodarskaya 19305 the number of infected shoots was 32 to 42 per cent. and infected leaves 28 to 42 per cent. less than on plants from early May sowing; yields were increased by 3 to 5 centners per ha. Later sowing (end of June and in July) resulted in even greater decreases in infection but the yield was lower. However, since the main purpose of summer sowings is to obtain healthy seed, it is advisable to sow later where soil moisture conditions are suitable.

In 1955, using seed from summer sowings in the usual spring period, infection was 28 to 33 per cent. less and yields 4·4 to 6·6 centners per ha. more than from seed derived from early sowings.

Tisdale (W. B.) & Moore (W. D.). **A new suggestion for control of damping-off and root-rot of Snap Beans.**—*Circ. Fla agric. Exp. Sta.* S-75, 6 pp., 1954. [Received January, 1957.]

The information given in this pamphlet advocating the control of *Rhizoctonia* infection of snap beans [*Phaseolus vulgaris*] by preparing beds five or more days before planting has already been noticed [35, p. 510].

Greenleaf (W. H.). **Inheritance of resistance to Tobacco-etch virus in Capsicum frutescens and in Capsicum annuum.**—*Phytopathology*, 46, 7, pp. 371–375, 1 fig., 1956.

In further studies at the Alabama Agricultural Experiment Station, resistance to tobacco etch virus in chilli peppers (*Capsicum frutescens* P.I. 152225 and the selection from *C. annuum* var. Cayenne, South Carolina 46252) [33, p. 402] was shown to be inherited monofactorially and determined by two recessive genes to which the symbols et^f and et^a have been allotted, the superscripts denoting their respective specific origins. It is postulated that they determine a slow virus multiplication rate and masking of symptoms, thereby permitting a clear-cut separation of susceptible from resistant plants three weeks after inoculation.

It is assumed that the existence in S.C. 46252 of one or more modifying genes that raise the resistance level to apparent immunity accounts for the development of such plants in the F_2 and among the selfed progeny of highly resistant progenitors. Thus, although absolute immunity in S.C. 46252 seems improbable, the possibility of its achievement by selection of minor genes for resistance cannot be excluded.

Of the two forms of resistance, that of S.C. 46252 is probably superior and therefore better suited for breeding operations. Moreover, the sterility barrier encountered in the interspecific cross *C. frutescens* F_2 (P.I. 152225 × Tabasco) × *C. annuum* var. Pimiento is a drawback to the use of P.I. 152225 as a parent. Most of the commercial chilli varieties cultivated in the United States belong to the *C. annuum* group.

Cox (R. S.), Conover (R. A.), & Sowell (G.). **Symptomatology of bacterial spot of Pepper and Tomato in southern Florida.**—*Phytopathology*, 46, 10, pp. 582–584, 1 fig., 1956.

Under prolonged periods of humidity, moisture, and temperature such as occur in southern Florida certain leaf diseases, usually described as leaf spots and characteristically exhibiting discrete lesions, may develop into scorches involving large areas of leaf. This is illustrated by bacterial spot (*Xanthomonas vesicatoria*) of tomatoes and [chilli] peppers [35, pp. 512, 700; 36, p. 161]. On chilli initial chlorotic areas on the margin of the leaf or within the blade soon became water-soaked and then necrotic, giving a scorched appearance. Guttation water appears to play a part in this process. The symptoms described were also induced in the greenhouse under prolonged periods of air saturation.

Semal (J.). **A virus of Celery related to Cucumis virus 1 st. Chr. Noordam.**—*Tijdschr. PlZiekt.*, 62, 4, pp. 177–178, 2 figs., 1956. [Dutch summary.]

Referring to the positive results obtained in inoculation tests on celery with the chrysanthemum strain of cucumber mosaic virus [36, p. 162], the author points out that dwarf white celery reacted negatively in Hollings's experiments with three strains of tomato aspermy virus [35, p. 18]. Unless the differential responses are attributed to varietal idiosyncrasy, the two viruses would not appear to be exactly identical.

Rich (S.). **Chemotherapy of Lettuce big-vein.**—*Plant Dis. Reptr*, 40, 5, pp. 414–416, 1956.

At the Department of Plant Pathology and Botany, Connecticut Agricultural Experiment Station, New Haven, healthy lettuce seedlings were watered with a number of solutions before transplanting to a field infested with lettuce big vein virus [34, p. 569]. Promising results were obtained with naphthaleneacetic acid (50 and 100 p.p.m.), 2,4,6-trichlorophenoxyacetic acid (50), indoleacetic acid (50), calcium chloride (1,000), and zinc sulphate (250), which reduced the percentage of diseased plants per plot from 8·6 (untreated) to 2·6 and 2·8, 3·6, 5·8, 6·4, and 6, respectively. Naphthaleneacetic acid, however, caused significant stunting. Zinc sulphate increased the fresh weight of the treated plants at harvest from 714 (control) to 871 gm. per plot.

Sinclair (J. B.) & Walker (J. C.). **Extent of cross protection among strains of Cucumber mosaic virus in Cucumber and Cowpea.**—*Phytopathology*, 46, 7, pp. 367–371, 1956.

For cross-protection tests at the Department of Plant Pathology, University of Wisconsin, three strains of cucumber mosaic virus [32, p. 164 and next abstract] were used: Y, originally isolated from spinach [27, p. 58], inducing a green mottle on zinnia and local lesions on cowpea; strain 14 from bean [*Phaseolus vulgaris*: 20, p. 334], which also causes green mottling of zinnia but infects cowpea systemically; and Price's No. 6 [14, p. 5], which induces local lesions on both hosts. In field trials with cucumbers in 1952, 1953, and 1954 cross-protection between the strains was incomplete, presumably because none became thoroughly established in the host, thus leaving it open for infection by the others. Greenhouse tests showed that two strains, inoculated simultaneously, could multiply simultaneously in the same cucumber plant, whether of the susceptible National Pickling or the resistant Ohio MR 17 variety, and that complete reciprocal cross-protection did not occur.

Primary leaves of cowpea inoculated with strain 14 afforded stronger cross-protection than did trifoliate leaves against the two local lesion strains, but the former tended to drop after the second inoculation. No inhibition or protection was observed when the inoculation of primary leaves with a local lesion strain was followed by either a second inoculation with the same strain on the trifoliate leaves or the application of strain 14 to the primary leaves.

Sinclair (J. B.) & Walker (J. C.). **Assays for resistance to Cucumber mosaic in the pickling Cucumber.**—*Phytopathology*, 46, 9, pp. 519–522, 1956.

In trials at the University of Wisconsin, Madison, to define the best methods of judging resistance of pickling cucumbers to cucumber mosaic virus [see preceding abstract] the degree of mottling on the fruits constituted the best criterion in the field, as resistant varieties are partially affected; though they become readily infected in the field they still yield well, having little severe mottling at the pickling stage. For example, in 1954 late planted resistant Ohio MR 17 yielded 55 lb. per 25-ft. row compared with 23 lb. for the susceptible National Pickling.

The rate of disease development in the greenhouse is quicker than in the field, increasing with rise of temperature from 16° to 28° C., and also with greater light intensity. The best expression of resistance is shown by height ratios between plants inoculated in the second or third leaf stage and the uninoculated, all grown under optimum conditions. Greenhouse assay, however, can only be supplementary to field evaluation.

Lindberg (G. D.), Hall (D. H.), & Walker (J. C.). **A study of Melon and Squash viruses.**—*Phytopathology*, 46, 9, pp. 489–495, 1956.

At the University of Wisconsin, Madison, 13 viruses causing infection in cucur-

bits but not in tobacco were obtained from Wisconsin, California, and Florida, and classified on the basis of physical properties and insect transmission into two groups: melon mosaic (five) and squash mosaic (eight). Viruses of the former group were transmitted by *Myzus persicae* and *Aphis gossypii* and lost their activity in 10 minutes at 60° C., during 28 days' ageing *in vitro* (with one exception, cantaloupe mosaic virus from California [31, p. 368]), and at a 5×10^{-3} dilution. Those of the latter group were not transmitted by aphids, withstood heating and ageing at the indicated levels, and dilution at 10^{-4} or 10^{-5}. Electron microscopy of purified preparations of the squash mosaic viruses revealed uniformly spherical or polyhedral particles [36, p. 172], those of one isolate averaging 367 Å in diameter. Attempts at the purification and electron microscopy of the melon virus group were unsuccessful.

All the melon mosaic strains, including (besides the cantaloupe mosaic virus) a Wisconsin isolate from muskmelon seed, one from squash in Florida, and the watermelon and yellow watermelon viruses [34, p. 76], also from Florida, were infectious on watermelon and are regarded as strains of one virus designated melon mosaic virus. The squash mosaic group comprised two strains of squash mosaic virus [35, p. 653] from California, two Wisconsin isolates from wild cucumber [*Echinocystis lobata*], typical and latent muskmelon viruses from Florida, and Freitag's cucurbit ring and wild cucumber viruses from California. All but the last-named were innocuous to watermelon and their antigenic properties were similar; they are consequently regarded as strains of squash mosaic virus. On the other hand, Freitag's wild cucumber virus is considered to be a separate entity by reason of its systemic infectivity of watermelon and serological differences from other members of its group, and is designated as wild cucumber mosaic virus.

Shepherd (R. H.) & Struble (F. B.). **Tobacco ringspot virus on Watermelon.**—*Phytopathology*, 46, 7, pp. 358–362, 2 figs., 1 graph, 1956.

A mechanically transmissible virus consistently associated with pimples disease of Black Diamond watermelon in Oklahoma was identified by studies on its symptomatology, host range, physical properties, cross-immunization relations, and serology as a yellow strain of tobacco ring spot virus [33, p. 66]. In one out of 48 trials it was transmitted from watermelon to the same host by the grasshopper *Melanoplus differentialis*, but 45 tests with *Aphis gossypii* gave negative results and no evidence of seed transmission was obtained.

A histological examination of pimpled fruits revealed the inception of the virus lesions in the mesocarp, where they appeared as small, necrotic areas subtended by hypertrophied parenchyma cells. More extensive necrosis and hyperplasia developed during the cooler weather of the late season.

A potent inhibitor of infection, which was inactivated by heating at 80° C., was demonstrated in the sap of watermelon fruits and foliage. The dilution end point of the fruit sap was approximately one-tenth that of the foliage, which lay between 10^{-2} and 10^{-3}.

Epps (W. M.). **An evaluation of fungicides for the control of diseases of Cucumbers in South Carolina, 1946–1955.**—*Plant Dis. Reptr*, 40, 5, pp. 441–442, 1956.

At the Clemson College Truck Experiment Station, Charleston, South Carolina, 25 fungicides were tested for overall effectiveness against downy mildew (*Pseudoperonospora cubensis*) [36, p. 84], anthracnose (*Colletotrichum lagenarium*) [35, p. 145], and fruit rot (*Pythium aphanidermatum*) of cucumber. Manzate and dithane M-22, tested on three varieties both as a dust and as a spray, each at several concentrations, over a five-year period showed no trace of phytotoxicity and were constantly superior to all the other fungicides under trial; they are, therefore, recommended with dithane Z-78 and parzate in second place. Ortho 406 was the

best of all the fungicides against anthracnose, though it was compared directly with manzate under conditions of severe infection only in 1954.

Wilson (J. D.), John (C. A.), Wholer (H. E.), & Hoover (M. M.). **Two foreign Cucumbers resistant to bacterial wilt and powdery mildew.**—*Plant Dis. Reptr*, 40, 5, pp. 437–438, 1956.

In screening trials started in 1952 by the Section of Plant Introduction, Ames, Iowa, the Ohio Experiment Station, Wooster, and Crop Research Department, H. J. Heinz Company, Bowling Green, Ohio, the cucumber selections P.I. 200815 and P.I. 200818, both from Burma, were resistant to bacterial wilt (*Erwinia tracheiphila*) [cf. 35, p. 381] and powdery mildew (*Erysiphe cichoracearum*). Both, however, showed marked infection by a virus, probably cucumber mosaic.

Epps (W. M.). **Gummy stem blight and other diseases on Cucurbits in South Carolina in the 1955 fall season.**—*Plant Dis. Reptr*, 40, 5, pp. 439–440, 1956.

During the autumn of 1955 gummy stem blight (*Mycosphaerella melonis*) [35, p. 145] damaged experimental plantings of muskmelons, cucumbers, and watermelons on the Clemson College Truck Experiment Station Farm at Charleston, South Carolina. The unusually severe outbreak largely resulted from the intensive culture of cucurbits for many years and from the excessive and frequent rains early in September. Other foliage diseases were also more prevalent than usual, particularly on muskmelons. *Alternaria* leaf spot (*A. cucumerina*) [loc. cit.] completely destroyed Rio Gold, while Georgia 47 and Smith's Perfect showed considerable resistance; powdery mildew (*Erysiphe cichoracearum*) [see preceding abstract] caused the defoliation of Smith's Perfect soon after harvest began, Rio Gold and Georgia 47 appearing highly resistant; downy mildew (*Pseudoperonospora cubensis*) [35, p. 145] was present but not serious, all the four varieties under test being resistant. Georgia 47 was the only one of the four varieties to produce even a fair crop.

Gerola (F. M.) & Laudi (G.). **Ricerche sulla fisiologia delle piante virosate. I. Contenuto in acido ascorbico nelle foglie di 'Spinacia oleracea' affette da mosaico del Cetriolo.** [Researches on the physiology of virus-affected plants. I. The ascorbic acid content of the leaves of *Spinacia oleracea* affected by Cucumber mosaic.]—*R. C. Accad. Lincei*, Ser. VIII, 20, 1, pp. 89–94, 1956. [English summary.]

Studies at the Institute of Botany, University of Milan, showed that the vitamin C contents of young, not completely opened, and mature leaves of healthy spinach plants were, respectively, 533, 729, and 613 mgm. per gm. fresh weight, the corresponding figures for plants infected by cucumber mosaic virus being 586, 665, and 495 mgm. For dehydroascorbic acid the figures were (healthy plants) 37, 41, and 42 mgm., and (mosaic plants) 59, 80, and 100 mgm. The ratio of vitamin C to dehydroascorbic acid was, therefore, much lower in affected than in healthy leaves.

The very high dehydroascorbic acid content in the mosaic-affected leaves is considered to be due either to increased activity of the enzymes oxidizing vitamin C or to decreased activity of those involved in the reduction of dehydroascorbic acid. The possible connexion between high dehydroascorbic acid and growth inhibition in infected plants is discussed.

Roland (G.). **Étude d'une mosaïque de la Chicorée de Bruxelles (Witloof), Cichorium intybus L., var. foliosum Bishoff.** [A study of a mosaic of Brussels Chicory (Witloof), *Cichorium intybus* L. var. *foliosum* Bishoff.]—*Parasitica*, 12, 1, pp. 1–7, 2 pl., 1956.

In May, 1955, Brussels chicory plants growing at the State Phytopathological

Station, Gembloux, Belgium, developed a yellow mosaic pattern on the leaves. The evidence obtained from sap inoculation and insect transmission tests, temperature-inactivation studies, and cross-protection tests on tobacco and *Nicotiana glutinosa* indicated that the condition was due to a strain of cucumber mosaic virus, for which the name *Cucumis* virus 1 var. *Witl.* is proposed [cf. 35, p. 862]. The variety differed from the type in that it was inactivated at a lower temperature (50° to 55° C.); was less virulent on *Datura stramonium*, beet, and *Nicotiana glutinosa*; caused a yellow mosaic on Brussels chicory; and was transmitted by *Myzus ascalonicus* in addition to *M. persicae*, though less actively.

Tomlinson (J. A.). **Control of Watercress crook root disease by zinc-fritted glass.** —*Nature, Lond.*, 178, 4545, pp. 1301–1302, 1956.

In laboratory studies at the National Vegetable Research Station, Warwick, on crook root disease (*Spongospora* sp.) of watercress [36, p. 4] there was an eight- to ten-day cycle from zoospore infection to further zoospore liberation. No infection occurred in laboratory tap water (containing 1·8 p.p.m. zinc) but it was heavy in local spring water (0·04 p.p.m.). In distilled water 19·5 per cent. of the primary and 12·5 per cent. of the secondary roots became infected, as against none and 0·03, respectively, in zinc sulphate solutions (0·5 p.p.m. zinc). At a concentration of 2 p.p.m. infection was suppressed.

A highly insoluble zinc-containing glass-frit (zinc F.T.E.) appeared to be a promising material from which zinc would be liberated slowly, and to be suitable for beds where 300,000 to 500,000 gals. of water pass through daily. Laboratory tests showed that 0·05 gm. of frit in 350 ml. of water prevented infection. In 1955 three separate experimental beds were treated with frit at 1 lb. per sq. yd. and in 1956 the outer strips of two full-sized commercial beds were treated at 1 lb. and ½ lb., all beds being initially heavily infected with crook root. Four to eight weeks later growth was stronger (and incidence low or nil) in the beds treated with zinc frits than in those treated with other frits or left untreated. These differences were still apparent after eight months.

Norton (D. C.), Menon (S. K.), & Flangas (A. L.). **Fungi associated with unblemished Spanish Peanuts in Texas.**—*Plant Dis. Reptr*, 40, 5, pp. 374–376, 1956.

At the Department of Plant Physiology and Pathology, Texas Agricultural Experiment Station, College Station, a total of 500 Spanish groundnuts, unblemished and apparently healthy, was picked at intervals during the six weeks before the normal harvest, surface-sterilized, and plated on a nutrient medium. An average of 22·2 per cent. was invaded by fungi. Of 1,785 unblemished stored nuts plated, 27·4 per cent. contained fungi. Those most frequently found were *Aspergillus flavus* [34, p. 125] (24·7 per cent. of the total isolates), *Alternaria* spp. (12·6), and *Fusarium* spp. (10·8).

Schulze (K.). **Das Haftstäuben. Ein neuer Weg zur Bekämpfung von Rebkrankheiten.** [Adhesive dusting. A new approach to the control of Vine diseases.]—*Umschau*, 56, 122, pp. 676–677, 1 col. pl. (on cover), 4 figs., 1956.

According to F. Stellwaag (1949), the annual outlay on the spraying of German vineyards (covering some 70,000 ha.) is nearly 30,000,000 DM. (inclusive of labour). The history of the development of the very promising condensation mist technique [35, p. 830], designed to effect economies in this direction, is outlined and some examples of its recent application are given. The special advantages of the aerosol treatment are its modest requirements both of water (only 15 to 25 l. per ha. as compared with 2,000 for ordinary spraying) and labour, the time needed on a level and a terraced vineyard being only one-third and one-seventh to one-eighth,

respectively, of that consumed by conventional procedures. The condensation mist contains both copper and sulphur, so that *Peronospora* [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*] can be jointly combated in the same operation.

THIEL (A.). **Vorläufiges Ergebnis eines zweijährigen Spritzversuches mit organischen Fungiziden im Vergleich zu Kupfer.** [Preliminary result of a two-year spray trial with organic fungicides in comparison with copper.]—*Weinberg u. Keller*, 3, pp. 97–105, 1 graph, 1956.

Results of experiments initiated in 1954 at Ockfen, Saar, showed that organic and copper fungicides were equally effective against rotbrenner [*Pseudopeziza tracheiphila*: cf. 35, p. 578] and *Peronospora* [*Plasmopara viticola*: cf. 35, p. 577] of vine, but not the former against *Oidium* [*Uncinula necator*: 35, p. 834]. Vines treated with organic preparations grew and yielded better, especially in climatically unfavourable sites.

PIERI (G.). **La sperimentazione antiperonosporica a Conegliano nel triennio 1952–1954.** [Experiments on the control of *Peronospora* at Conegliano in the three-year period 1952–1954.]—*Ann. Sper. agr.*, N.S., 10, 2, pp. 555–564, 1956. [English summary.]

The results of further experiments on the control of vine downy mildew (*Plasmopara viticola*) conducted at the Experimental Station of Viticulture and Oenology, Conegliano, Italy, from 1952 to 1954, with various copper and non-copper fungicides [32, p. 362] confirmed those recorded at other research institutes in Italy [36, p. 84] and abroad. The non-copper materials containing zineb, captan, and nitrobenzol were comparable with 1 per cent. Bordeaux mixture. The secondary effects of the non-copper materials (yellowing and premature shedding of the leaves) were obviated by the addition of small amounts of copper salts. A suitable mixture of non-copper products and copper sulphate might give excellent control and at the same time serve to economize in copper.

The products containing copper oxychloride and copper oxide are best reserved for the early applications and Bordeaux mixture for the later ones.

MESSORI (A.). **Gli osservatori antiperonosporici funzionano nell' Acquese da 25 anni.** [The anti-*Peronospora* observatories have been functioning in the Acqui district for 25 years.]—*Ital. agric.*, 93, 6–7, pp. 523–529, 4 figs., 1 diag., 1956.

This informative review of 25 years' progress of the vine downy mildew (*Plasmopara viticola*) spray warning service in the Acqui district of Lombardy, Italy [cf. 36, p. 109 *et passim*], which comprises 42 observatories, is supplemented by a table giving figures of the economies in the consumption of copper sulphate and other copper fungicides effected by means of the forecasts.

BRANAS (J.). **Chronique. La 'maladie' du 22 A.** [Current notes. The 'disease' of 22 A.]—*Progr. agric. vitic.*, 146, 45–46, pp. 289–297, 1956.

During the past few years the white, non-grafted 22 A. Baco vine has been seriously affected in all parts of lower Armagnac [south-western France] by flavescence [3, p. 504], known to be induced by excess of water in the soil. In the area concerned the years 1942 to 1949 were all characterized by low rainfall; this period was followed by three very wet seasons from 1950 to 1952; then a dry period again set in which lasted until 1956. The first outbreaks probably occurred in 1950, prevalence increasing during the succeeding two years. The second dry period failed to improve the situation because, presumably, the roots had already been killed by excess of water.

Harmon (F. N.) & Weinberger (J. H.). **Foliage burn of Vinifera Grapes as a symptom of White Emperor disease.**—*Plant Dis. Reptr*, 40, 4, pp. 300–303, 1956.

The symptoms of the White Emperor virus disease on the Emperor, Cardinal, and Red Malaga vines [36, p. 165] are described. At the United States Horticultural Station, Fresno, California, 32 vine varieties and two unnamed seedlings having burned foliage symptoms similar to those on Cardinal and Red Malaga were indexed by budding to bearing Emperor vines in March, 1955. By the autumn a striking difference in fruit colour was observed between the budded and unbudded vines, indicating transmission of the virus. No burned foliage symptoms developed during the first year, suggesting that fruit was affected more rapidly than foliage, late colouring of the fruit and reduced sugar content being direct and primary symptoms. The disease should be suspected wherever early autumnal foliage burn occurs on vinifera grapes, particularly those grown on root-stocks, and where no other cause such as a soil deficiency is known.

Staehelin (M.), Aebi (H.), & Bolay (A.). **Essais de lutte contre le coître de la Vigne (Coniella diplodiella (Speg.) Pat. et Syd.).** [Experiments on the control of white rot of the Vine (*Coniella diplodiella* (Speg.) Pat. & Syd.).]—*Annu. Agric. Suisse*, (70), N.S., 5, 5, pp. 555–560, 1956. [German, English, and Italian summaries.]

On the basis of experiments performed in 1955, attempts to combat white rot (*Coniella diplodiella*) by soil disinfection in the vineyards of French Switzerland [35, p. 414] are to be abandoned for the time being. Promising results were given by the application, 16 to 18 hours after a hailstorm, of 0·5 per cent. captan and 0·25 per cent. mesulphan in wettable dust or paste form [36, p. 165], the efficiency of which was rated at 85, 75·1, and 77 per cent., respectively.

Gupta (S. L.). **Occurrence of Aspergillus carbonarius (Bainier) Thom causing Grape rot in India.**—*Sci. & Cult.*, 22, 3, pp. 167–168, 2 figs., 1956.

A transit rot of grapes, characterized by the appearance of flaccid areas below the skin, which becomes light yellowish-brown and loose, and the disintegration of affected tissues, was observed in the market at Kanpur, India. The affected fruit falls off easily, is pulpy, and emits a typical fermenting odour. The rot is often quite extensive. *Aspergillus carbonarius*, not previously recorded in India, was isolated from infected fruits. In inoculation trials using a spore suspension it was found to be pathogenic and to gain entrance through bruised surfaces and the stem end of unbruised fruit. The fungus was reisolated from the rot.

The disease causes considerable wastage of grapes during transit and marketing.

Smith (K. M.). **A textbook of plant virus diseases. Second edition.**—vii+652 pp., 93 figs., 2 diags., London, J. & A. Churchill, Ltd., 1957. 65*s*.

The present edition of this important treatise [cf. 17, p. 52] has been almost entirely rewritten to include the latest information on over 300 separate viruses, which are arranged in alphabetical order under their English popular names, amplified by cross-references and an index of synonyms (at the end of the volume) to facilitate the identification of a given disease. As far as possible the properties of each virus are given, followed by a detailed description of the various diseases caused. The illustrations have been carefully selected to show symptoms of diagnostic value. A bibliography of 32 pages and a short list of addenda are appended.

Goidànich (G.). **Le malattie da virus delle piante.** [Virus diseases of plants.]—'*Settim. cult.*' *Cent. Studi Trento Univ. Bologna*, 1, pp. 85–118, 16 figs., 2 diags., 1955.

This is a concise, popular survey of the history of virus study, the nature, charac-

teristics, origin, symptoms, and taxonomy of viruses, and their transmission and control. The author indicates acceptance of the biological, as opposed to the chemical, theory of the nature of viruses and emphasizes his belief in the efficacy of heat treatment.

MacClement (W. D.) & Richards (Marilyn G.). **Virus in wild plants.**—*Canad. J. Bot.*, 34, 5, pp. 793–799, 2 graphs, 1956.

In a survey of wild flowers growing in the Royal Botanical Gardens, Hamilton, Ontario, from 1951 to 1954, very few were found to be free from virus infection. Flowering plants growing below the surface of open water also contained low amounts of virus. The total annual infection by mechanically transmissible viruses in the sample plots (as found by transmission to a series of standard test plants) was approximately 10 per cent. of the population. Many economically important viruses, including sugar beet curly top, cucumber mosaic, tobacco ring spot, and tomato spotted wilt were identified in the wild plants, generally present as mixtures. Several hitherto unidentified viruses were observed, including one in *Solidago*.

Montreuil (M.). **Évolution des idées sur la nature et la multiplication des virus-protéines.** [Development of ideas on the nature and multiplication of virus proteins.]—*Rev. Quest. sci.*, Sér. 5, 17, 1, pp. 59–89, 8 figs., 5 diags., 1956.

This review of the development of concepts on the nature of virus proteins and the mechanism of their multiplication is based on 24 contributions to the literature on the subject and is presented under the following headings: development of the term 'virus'; general characters of viruses; virus diseases; general properties of viruses; multiplication of viruses, hypotheses concerning their nature and origin; the life-cycle of bacteriophages and the pro-virus concept; generalization of the virus theory of cancer; and mode of intervention of viruses in cellular metabolism.

Bode (O.). **Über Möglichkeiten und Grenzen der Elecktronenmikroskopie bei morphologischen Untersuchungen an Pflanzenviren.** [On the possibilities and limitations of electron microscopy for morphological investigations of plant viruses.]—*Angew. Bot.*, 30, 4–5, pp. 147–150, 1956.

The author discusses recent advances in the study of viruses by electron microscopy. He considers that future research should be concentrated on the means of acquisition of the virus, its multiplication, and translocation within the host tissue. The mechanisms of insect transmission should also repay intensive study.

Roland (G.). **La chimiothérapie et les viroses végétales.** [Chemotherapy and plant viroses.]—*Meded. LandbHoogesch. Gent*, 20, 3, pp. 447–457, 1955.

After a succinct review of some of the more important contributions to the literature dealing with the internal chemotherapy of plants affected by virus diseases (45 titles), the author expresses the view that future studies should be directed towards the discovery of substances harmless to the host but exerting a residual retarding effect on the multiplication of the virus, and others inactivating the virus while being of very low toxicity to the host. The former group ('virostatic' substances) would be used in the field to diminish as much as possible the effects of virus disease on the crop. The second group ('inactivators' or 'virocides') would be used in the laboratory to cure virus disease in propagating material in order to produce a new, healthy strain of a contaminated variety.

Goodchild (D. J.). **Relationships of legume viruses in Australia. I. Strains of Bean yellow mosaic virus and Pea mosaic virus. II. Serological relationships of Bean**

yellow mosaic virus and Pea mosaic virus.—*Aust. J. biol. Sci.*, 9, 2, pp. 213–230; 231–237, 2 pl., 1 fig., 1956.

Investigations begun in 1953 at the University of Sydney to determine the sap-transmissible viruses present in pea and bean (*Phaseolus vulgaris*) and broad bean crops in New South Wales, their host ranges and possible potential, and later extended to include pasture legumes, particularly subterranean clover, showed that two strains of bean yellow mosaic virus [34, p. 725] and two of pea mosaic virus [23, p. 85; 29, p. 140] are present in Australia.

Similarity in symptom expression of the two viruses on the differential hosts common to both was apparent, and they could not be separated on this basis. Clonal and environmental variations are considered largely responsible for this result. In one experiment with broad beans inoculated and grown under controlled conditions of light and temperature variation in symptom expression was so great that no difference between the viruses could be detected.

The wide host range of the viruses studied (nine differential hosts being used in the inoculation tests) indicates an adequate reservoir of virus in the pastures of Australia. This may be important in the establishment and maintenance of subterranean clover, as all varieties of this species tested were highly susceptible to both the viruses.

The serological activity of both strains of pea mosaic virus was demonstrated. Cross-agglutination experiments showed that the strains of pea mosaic virus and bean yellow mosaic virus studied are serologically related, and cross-protection tests indicated that these strains belong all to the same virus. To distinguish strains of viruses belonging to this broad group, therefore, it is still necessary to consider their reactions on differential hosts, i.e., bean and soy bean.

Rubio [Huertos] (M.) & Van Slogteren (D. H. M.). **Light and electron microscopy of X-bodies associated with Broad-Bean mottle virus and Phaseolus virus 2.**—*Phytopathology*, 46, 7, pp. 401–402, 1 fig., 1956.

The broad bean mottle virus material used in this comparative study (jointly reported from the Instituto de Edafología, Madrid, and the Laboratory for Flower Bulb Investigation, Lisse, Holland), was supplied by F. C. Bawden of Rothamsted Experimental Station [31, p. 469], while that of *Phaseolus* virus 2 [bean yellow mosaic virus] was obtained by inoculating broad beans with sap from infected gladiolus plants [34, p. 282].

The X-bodies associated with broad bean mottle virus in the cells of the host were usually ovoid and appeared granular under the light microscope. After two to three weeks they became vacuolate and were mainly or entirely composed of spherical particles visible in electron micrographs.

Under the light microscope the X-bodies of bean yellow mosaic virus resembled those of broad bean mottle virus. Electron micrographs revealed that they were composed principally of amorphous material. A few aggregated, flexuous, rod-shaped particles were present, but it was not ascertained whether they were inside or adsorbed to the surface of the X-bodies.

The broad bean mottle virus cell inclusions were found exclusively in the chlorotic areas of the leaf, whereas those of bean yellow mosaic virus occurred throughout the leaf and stem.

Rubio [Huertos] (M.). **Origin and composition of cell inclusions associated with certain Tobacco and crucifer viruses.**—*Phytopathology*, 46, 10, pp. 553–556, 2 figs., 1956.

At the University of California, Berkeley, further electron microscope studies on tobacco mosaic virus X-bodies in tobacco [33, p. 701; cf. 35, p. 640] showed them to be composed chiefly of amorphous material with little virus, though those of the

aucuba strain of this virus contained much (*Microbiol. esp.*, 3, pp. 207–232, 1950).

Soon after infection of turnip with cabbage black ring [spot] virus X-bodies formed from the coalescence of granules, but did not usually become vacuolate. Later they contained flexuous strands made up of long parallel fibrils, which broke down transversely into flexuous virus particles. At a later stage there were spherical or ovoid, vesicular cell inclusions with a distinct outer membrane. The contents, clear at first, formed an angular, crystal-shaped body of a strong yellow colour, remaining intact on the disappearance of the membrane.

Cauliflower mosaic virus in cauliflower gave rise, some three to four weeks after infection, to inclusion bodies of the non-crystalline, X-body type, spherical to ovoid, or sometimes irregular in shape. Virus particles were not detected. The inclusions associated with turnip yellow mosaic virus in Chinese cabbage (*Brassica pekinensis*) were of the same type as in cauliflower mosaic, often compact and granular, though sometimes vacuolate or reticulate. Generally ovoid, they matured in the advanced stages of the disease, and were formed by the degeneration of clumps of plastids.

Thomson (A. D.). **Studies on the effect of malachite green on Potato viruses X and Y.**—*Aust. J. agric. Res.*, 7, 5, pp. 428–434, 1956.

In studies at the Crop Research Division, Department of Scientific and Industrial Research, Lincoln, New Zealand, the addition of malachite green failed to eliminate potato viruses X and Y from shoot apices of Dakota Red and Aucklander Short Top in tissue culture, and had no significant effect on the concentration of virus X, as indicated by local lesion counts on *Gomphrena globosa*. It is suggested that the positive results obtained by Norris, who used this method with potato virus X [35, p. 118], may have been due to the absence of the virus from the apical tissues [35, p. 215] rather than to any action of the dye.

Brasilien. Vorschriften des Pflanzenschutzgesetzes. [Brazil. Regulations of the Plant Protection Statute.]—*Amtl. PflSchBestimm.*, N.F., 9, 3, pp. 115–122, 1956.

The provisions of the Plant Protection Statute of 1934 [14, p. 544] are recapitulated. An Order of the Ministry of Agriculture dated 10th November, 1955, prohibits the importation of potatoes into Brazil unless the consignments are accompanied by a phytosanitary certificate from the country of origin with regard to *Synchytrium endobioticum* and *Corynebacterium sepedonicum* and stating that the potatoes are free from these and other dangerous diseases and originate in authorized breeding stations where official inspection for virus diseases is practised.

Progress Report, Dominion Experimental Station, Morden, Manitoba, 1947–1954, 64 pp., 9 figs., 1956.

In the section of this report [cf. 29, p. 290] dealing with vegetable crops (pp. 27–33) C. Walkof and V. W. Nuttall state that the Morcrop hybrid pickling cucumber is resistant to wilt [? *Erwinia tracheiphila*: 35, p. 421]. Improved strains of rhubarb from crosses involving Macdonald and Canada Red are in prospect; these parent varieties have much resistance to the serious red leaf disease [cause unspecified].

In the section on ornamentals (pp. 40–43) H. F. Harp states that several full-double, creamy-white rose selections from Prairie Youth crossed with Prairie Wren and selected seedlings with *Rosa altaica* in their breeding are resistant to black spot [*Diplocarpon rosae*]. E. D. Putt, dealing with forage crops (pp. 46–50) reports that at Morden the new maize hybrids Morden 74, Morden 77, Wisconsin 240, Warwick 210, and Kingscrost KE 3 developed, respectively, 9·8, 7·3, 6·8, 5·4, and 7·9 per cent. smut [*Ustilago maydis*: 29, p. 291] compared with 11·7 per cent. on

the older variety Falconer. Resistance to sunflower rust [*Puccinia helianthi*: 34, p. 652; 35, p. 876] was demonstrated to be of simple inheritance from one source. W. J. Breakey, reporting on cereals (pp. 51–55), states that in eight years' tests the wheat varieties Selkirk [cf. 36, p. 176], Lee, Redman, and Thatcher averaged, respectively, 1·1, 10·2, 11, and 17·5 per cent. stem rust [*P. graminis*] and 28·6, 1·9, 51·1, and 58·8 leaf rust [*P. triticina*: loc. cit.], the average yields per acre being 50·3, 48·3, 43·5, and 42·3 bush. per acre. Among the durum wheats, Golden Ball, D.T. 136, and D.T. 137 [cf. 35, p. 815] averaged, respectively, over the same period 7·9, 6·9, and 1·6 per cent. stem rust and 0·6, 0·5, and 0·5 per cent. leaf rust, with average yields of 32·8, 42·2, and 52 bush., but Golden Ball is of low quality and is not recommended. Husky barley [loc. cit.] averaged the lowest loose smut [*U. nuda*] and highest yields (4·6 per cent. and 87 bush., respectively).

Simmonds (J. H.). **Science Branch. Plant Pathology Section.**—*Rep. Dep. Agric. Qd*, 1955–56, pp. 65–66, 1956.

It is stated in this report [cf. 35, p. 876] that crown rot (*Fusarium culmorum*) of wheat appeared in a more severe form than at any time during the previous six seasons, causing up to 30 per cent. infection in the Cecil Plains–Brookstead area. The host range of the fungus in Queensland has extended to include barley, oats, canary seed [*Phalaris canariensis*], and *P. paradoxa*. On the Atherton Tableland the hot, wet summer led to a high incidence of brown spot (*Physoderma zeae maydis*) [*P. maydis*] of maize, and some crops had lost 30 per cent. of their foliage before tasseling.

In field tests of cowpea for resistance to stem rot (*Phytophthora* sp.) the varieties Blackeye 5, C.P.I. 12153, and C 521 showed promisingly high resistance, while Giant, Anderson's Early Giant, Cristaudo, and Soutter exhibited fair to good resistance under normal epidemic conditions.

In the Kingaroy district there was a relatively high incidence of the two virus diseases of groundnuts, chlorosis [tomato spotted wilt virus] and bunchy plant [tomato big bud virus], with the latter predominating [34, p. 274]. In some fields combined losses from these diseases were as high as three per cent.

Phytophthora cryptogea [map 99] has been identified as the causative agent of a rot of the main tap root of lucerne [cf. 34, p. 458], associated with the thinning out of young stands. The disease is most serious in heavy soils and in those subject to waterlogging. Other diseases occurring on lucerne were summer black stem (*Cercospora zebrina*) and anthracnose (*Colletotrichum trifolii*) [33, p. 637].

A survey of the diseases of sunflower is reported. Rust (*Puccinia helianthi*) and a white rust (*Cystopus* sp.) were the most spectacular. Other minor diseases were a *Septoria* leaf spot, crown and stem rots caused by *Sclerotinia sclerotiorum*, *Sclerotium rolfsii*, and *Macrophomina phaseoli*, and head rots caused by *Rhizopus* sp. and *Sclerotinia sclerotiorum*.

Stem rot (*Fusarium* sp.) of ginger was only recorded twice. [*Datura*] rugose leaf curl virus in white and red clovers and lucerne is causing some concern in the Lockyer Valley [35, p. 681]. Tomato big bud virus has been recorded in a number of legumes [cf. 35, pp. 48, 355].

A failure of mature avocado trees, known for some years in Southern Queensland and resembling the 'avocado decline' of America, has now been definitely associated with *Phytophthora cinnamomi* [cf. 35, p. 690].

Passiflora edulis grafted on to *P. flavicarpa* stock has shown complete field immunity from *Fusarium* wilt [*F. oxysporum* f. *passiflora*: 35, p. 203].

In recent years the late summer and autumn plantings of pineapple have suffered serious losses from top rot (*Phytophthora cinnamomi*) [34, p. 136].

There is evidence that a few cover sprays against leaf spot [*Mycosphaerella musicola*: 35, p. 877] late in the life of the banana plant may protect the foliage

sufficiently to ensure the satisfactory development of the fruits. *Chloridium musae* and *Ramichloridium musae* [cf. 25, p. 220] are associated with speckle diseases of banana in North Queensland.

The prevalence of the yellow crinkle [tomato big bud] virus disease of papaw [29, p. 36], especially in the central districts, caused some concern. Northern leaf spot (*Corynespora cassiicola*) [35, p. 877] was recorded causing papaw fruit rot for the first time in South Queensland.

Tomato leaf shrivel virus disease was found to be caused by a strain of potato virus Y, tomato yellows by this virus in combination with the aucuba strain of tobacco mosaic virus, and tomato fern leaf shrivel by the same virus in combination with cucumber mosaic virus. Tomato fruit rot caused by *C. cassiicola* was reported from North Queensland.

WILTSHIRE (S. P.). **Plant diseases in British Colonial Dependencies : a half-yearly report.**—*F.A.O. Pl. Prot. Bull.*, 5, 1, p. 6, 1956.

Diseases reported from Malaya [cf. 35, p. 879] include *Calonectria rigidiuscula* [loc. cit.], associated with die-back of cacao [cf. 36, p. 10], and *Puccinia polysora* on maize [map 237], a new record, though the fungus appears to have been present since 1950; it has been found in widely separated areas from Kedah in the north to Singapore in the south. *Corticium solani* was recorded on maize locally for the first time, causing a banded rot of the lower leaf sheaths. *Helminthosporium incurvatum* was associated with a severe leaf spot of young coco-nut palms in one area. In Trinidad, banana leaf spot (*Mycosphaerella musicola*) was effectively controlled by low-volume oil-based sprays applied by means of a power mist-blowing sprayer [cf. 35, p. 621]. Tip-spotting caused by ascospore infection was conspicuous.

Rapport annuel pour l'exercice 1955. [Annual report for the year 1955.]—*Publ. Inst. nat. agron. Congo belge, 1955* (hors sér.), 568 pp., 1 map, 1956.

In the section (pp. 140–148) of this report [cf. 35, p. 591] dealing with phytopathological work at Yangambi Research Centre, Belgian Congo, it is stated that during 1955 infection of coffee crowns by *Corticium salmonicolor* was more frequent than in most years. Rust (*Puccinia polysora*) [35, p. 592; 36, p. 174] spread to most of the maize fields, but did not reduce yields. Helminthosporiosis affected all maize [*Helminthosporium turcium*] and rice [*Ophiobolus miyabeanus*] plantings and was rather severe on sugar-cane [*H.* spp.]. Early in the year primary and secondary infections of bananas by bunchy top [virus: map 19] were observed. Numerous cases of root rot of cassava due to *Armillaria mellea*, *Fomes lignosus*, and *Botryodiplodia theobromae* were noted. A leaf disease of pepper [*Piper nigrum*] was caused by *Rhizoctonia* [*Corticium*] *solani*; removal of infected, fallen leaves at frequent intervals kept incidence reasonably low. The crowns of *Eucalyptus* spp. were attacked by *C. salmonicolor* and the leaves by *C. solani*.

In the section dealing with *Hevea* rubber (pp. 50–67) it is stated that in a test of varietal resistance to brown bast [35, p. 591] clones BRI and Y3/46 had, respectively, 20 and 3 per cent. infection. Infection by *Fomes* [? *lignosus*] was less on heavy than light soil whether the clearing had been burnt or not [loc. cit.]. Six years after grafting 24 per cent. of the trees planted immediately after clearing were dead, compared with 13 per cent. of those planted after three years and 5 per cent. after nine years. In trees four years old or less 16 per cent. of the deaths were attributable to *Armillaria* [*mellea*: loc. cit.], the corresponding figures for trees five and six years old being, respectively, 32 and 44 per cent. On a heavy soil (30 to 35 per cent. clay) the death rate due to root rots eight years after planting seedlings was 5 per cent. among trees receiving the usual surgical treatment plus 2 per cent. copper sulphate; 17 per cent. among trees the base of which had been

laid bare and then covered up again; and 24 per cent. among the untreated. On a light soil (20 to 30 per cent. clay), where trees had been grafted *in situ*, ten years after grafting the population was 80 per cent. of the original one for the treated trees and only 46 per cent. for the untreated.

Microclimatic conditions have important effects on the spread of *Helminthosporium heveae* [34, p. 584]: nurseries in open situations were severely affected, while those in more confined or slightly shaded places had only very slight infection. When a group of infected trees was provided with slight shade the leaves that developed subsequently were protected against infection, though the leaves of unshaded trees continued to bear lesions.

In the report from the experimental planting at Mukumari, Central Congo (pp. 333–337), it is stated that the rubber clone M8 showed good resistance to attack by *Oidium* [*O. heveae*].

In the report from the Phytopathological Laboratory, Kaniama Station, Haut-Lomami, (pp. 453–462), figures are given showing that two soil injections 17·5 cm. deep each of 4 ml. of a mixture of equal parts dichloropropene and dichloropropane or surface treatment with calcium cyanamide 2,500 kg. per ha. greatly reduced differences in susceptibility to bacterial wilt (*Xanthomonas* [*Pseudomonas*] *solanacearum*) among five varieties of Virginia and seven of Kentucky tobacco. Among the former, Vamorr 48 and Dixie Bright were less susceptible than Yellow Mammoth and Delcrest. Of the Kentucky varieties, Virginia Dark was less susceptible than Nyasaland, Kentucky 160, Dark Fired Madole, and Single Sucker, and Dark Fired Kentucky and Western were less than Dark Fired Madole and Single Sucker.

In the report from the Regional Laboratory of Phytopathology, Mulungu-Tshidinda, Kivu Sector (pp. 480–482), it is stated that in inoculation tests on material from different progenies, clone 1353 of *Chrysanthemum cinerariifolium* was the most resistant to *Ramularia bellunensis* [35, p. 592]. Of various products tested the following gave the best control, in descending order of efficacy: captan, ethyl mercury chloride, zineb, copper oxide; only captan was non-phytotoxic.

A species of *Fomes*, probably *F. lignosus*, was relatively common on coffee and tea. A form of *A. mellea* with white, floury cordons quite distinct from the usual rhizomorphs was prevalent at Kivu [? on tea]. *Rosellinia bunodes* caused somewhat frequent infection of tea and *Cinchona*.

Noble (M[ary]) & Graham (D. C.). **A selective medium for the isolation of coliform soft rot bacteria from plant tissue.**—*Nature, Lond.*, 178, 4548, pp. 1479–1480, 1956.

At the Department of Plant Pathology, East Craigs, Edinburgh, a selective agar medium for the isolation of species of *Erwinia* and *Aerobacter* was developed; it contained salicin, sodium taurocholate, and an indicator (bromthymol blue) in addition to the basal salts. Developing colonies should be removed at once to meat infusion agar.

It has been shown that the reaction of the potato black leg organism (*E. atroseptica*) in producing alkali in an ethyl alcohol peptone medium [32, p. 642] is not specific, the same effect being obtained with *E. carotovora* and *E. aroideae* [strain of *E. carotovora*].

Ferenczy (L.). **Antibacterial substance in seeds of Fraxinus excelsior L.**—*Acta biol. Szeged* (formerly *Acta Univ. Szeged*), N.S., 2, 1–4, pp. 13–14, 1956.

In further work at the University of Szeged, Hungary, the mucinous layer of dormant seeds of ash was found to contain a substance which inhibits the germination of other seeds and which is probably responsible for the dormancy of the seed itself.

In agar diffusion studies of its activity against 18 bacteria the exudate from the mucinous layer displayed more or less bacteriostatic activity against 14, including *Agrobacterium tumefaciens*, *Bacillus cereus*, *Xanthomonas malvacearum*, and *X.* [*Pseudomonas*] *solanacearum* [cf. 36, p. 113]. It is proposed to isolate the factor responsible and to determine whether it is identical with that inhibiting seed germination.

Thirumalachar (M. J.), Patel (M. K.), Kulkarni (N. B.), & Dhande (G. W.). **Effects in vitro of some antibiotics on thirty-two Xanthomonas species occurring in India.**—*Phytopathology*, 46, 9, pp. 486–488, 1956.

At the College of Agriculture, Poona, Bombay State, aureomycin, terramycin, and chloromycetin [chloramphenicol], all at 60 μgm. per ml., sodium penicillin G (50 units), and dihydrostreptomycin (20 μgm.) were tested *in vitro* by the cup assay method against 32 species of *Xanthomonas* occurring in India [36, p. 178]. All the antibiotics except penicillin were more or less effective against every one of the pathogens, which included *X. alfalfae* on lucerne, *X. betlicola* on *Piper betle*, *X. cajani* on pigeon pea, *X. campestris* on cabbage, *X. cassiae* on *Cassia tora*, *X. citri* on lime, *X. malvacearum* on cotton, *X. phaseoli* [var.] *sojense* on soy-bean, *X. ricinicola* on *Ricinus communis*, *X. vesicatoria* on chilli, and *X. vignicola* on cowpea.

Penicillin was effective against only 12 of the bacteria, even at concentrations of 500 units and upwards. When cultures of *X. alfalfae* and *X. cassiae* were mixed and plated out on nutrient agar containing 1,000 units of penicillin per ml., only the former species developed. It is suggested that this differentiation might be used to separate other closely related species, e.g., *X. citri* and *X. bilvae*, the latter parasitizing *Aegle marmelos*, which *X. citri* can also infect.

Kobel (F.). **Die Spelzenbräune des Weizens.** [Glume blotch of Wheat.]—*Mitt. schweiz. Landw.*, 4, 10, pp. 163–168, 2 figs., 1956.

In connexion with the outbreaks of glume blotch (*Leptosphaeria* [*Septoria*] *nodorum*) of wheat which have occurred during the recent wet summers in Switzerland [32, p. 246], especially in the St. Gall Rhine Valley, the author presents essential information on the symptoms, distribution, and economic importance of the disease, with a concluding note on prospects of breeding for resistance. This is likely to be complicated since the pathogen is almost entirely unspecialized, attacking all types of wheat, even the primitive, and numerous grasses. However, the Probus variety appears to be somewhat tolerant, judging by its relatively small yield reductions at Haag-Gams in 1954–5 (average of 7 per cent. as compared with 26 and 27 for Heine VII and Cappelle, respectively).

Lebeau (F. J.), Sosa (O. N.), & Fumagalli (A.). **Yield reduction in Wheat by stripe rust.**—*Plant Dis. Reptr*, 40, 10, p. 886, 1956.

In the valley of Quezaltenango, Guatemala, the 1954 and 1955 yields of Supremo 211 wheat were only 63 and 65 per cent., respectively, of the average for the same variety in the two preceding years, and 67 and 66 per cent., respectively, of those of Frondoso, compared with 93 to 124 per cent. in 1948–53. As there were severe epidemics of *Puccinia glumarum* [30, p. 123] in 1954 and 1955, and Supremo 211 is less resistant than Frondoso, the yield losses of the former are concluded to be due to this disease.

Hassebrauk (K.). **Die physiologische Spezialisierung des Weizenbraunrostes (Puccinia triticina Erikss.) in Deutschland im Jahre 1954.** [Physiologic specialization of Wheat brown rust (*Puccinia triticina* Erikss.) in Germany in the year 1954.]—*Z. Pflanzenz.*, 37, 1, pp. 96–98, 1957.

The examination during 1954 at the Institute for Physiological Botany, Bruns-

wick, of 164 samples of *Puccinia triticina* collected on wheat in 86 localities in Western Germany [35, p. 94] disclosed the presence of races 1, 1a, 17, 17a, 20, 52, 53, 53a, 93, 93a, 155, and a new one closely resembling the last-named but differentiable by its virulence on the test variety Malakoff.

Races 17 and 1 were represented in 80 and 30 per cent., respectively, of all the samples analysed.

FORSYTH (F. R.). **Effect of ions of certain metals on the development of stem rust in the Wheat plant.**—*Nature, Lond.*, 179, 4552, pp. 217–218, 1957.

At the Plant Pathology Laboratory, Winnipeg, Manitoba, the reaction of the wheat variety Khapli [36, p. 180] to races of *Puccinia graminis* was altered from susceptible to resistant by the uptake of iron by the roots. The resistance of seedling Khapli leaves to race 15B was altered to susceptibility by adding zinc sulphate, manganese sulphate, or cobalt nitrate to the liquid culture media in which the seedlings were grown.

Concentrations of 40 to 200 p.p.m. ferric sulphate in the nutrient solution killed rust infections in leaves of Little Club wheat seedlings. It would appear that the action of iron on rust resistance is opposite to that of zinc and manganese and it is suggested that iron metabolism plays a part in the mechanism of the resistance of wheat to *P. graminis*.

PETERSEN (L. J.). **A method of observing stomatal penetration by uredospore germ tubes of Puccinia graminis f. sp. tritici.**—*Phytopathology*, 46, 10, pp. 581–582, 1 fig., 1956.

At the Colorado Agricultural Experiment Station, Fort Collins, it was found that if wheat leaves, inoculated with uredospores of *Puccinia graminis*, were stained in lactophenol-cotton blue after spore germination began, and then sprayed twice with cellulose acetate at an hour's interval, the acetate film could be removed with a good impression of the germinating spores in relation to the stomata.

KLEMENT (Z.) & KIRÁLY (Z.). **Hyperparasitic chain of a fungus, a bacterium and its phage on Wheat.**—*Nature, Lond.*, 179, 4551, pp. 157–158, 1957.

During 1955 *Xanthomonas uredovorus* [34, p. 439] was isolated from populations of *Puccinia graminis* on wheat in Hungary. In the course of investigations on the hyperparasitism of *X. uredovorus*, which is quite serious in greenhouse cultures, a bacteriophage specific to this species was isolated.

PURDY (L. H.). **Does post-treatment storage of Wheat seed increase the effectiveness of fungicides against smut?**—*Plant Dis. Reptr*, 40, 10, pp. 878–881, 1956.

Studies by the Agricultural Experiment Stations of Idaho, Oregon, and Washington showed that the effectiveness of agrox, anticarie, ceresan D, ceresan M, MEMA, panogen 15, and velsicol emmi for the control of wheat bunt [*Tilletia* spp.] was not increased by storage of treated seed in paper or cloth bags [cf. 33, p. 528; 35, p. 599].

GRASSO (V.). **Dwarf bunt of Wheat in Italy.**—*F.A.O. Pl. Prot. Bull.*, 5, 1, pp. 9–10, 1956.

While *Tilletia controversa* was first recorded on wheat in Italy in 1955 [35, p. 433], typical chlamydospores were found by the writer on Italian material in 1948 and the disease had then, presumably, long been present in the country. Among the records supporting this view is a statement by Peglion (Le malattie delle piante coltivate cagionate da parasiti vegetali o da agenti inanimati, 8th ed., Casale Monferrato, Milano, 1947) that epidemic outbreaks of bunt occurred in 1879, 1919, 1929, and 1946, mostly in the Parma–Piacenza area of Emilia, which is the principal locality where dwarf bunt was found recently [loc. cit.]. The occurrence of dwarfing

in some of the outbreaks and the descriptions of the chlamydospores suggest that *T. controversa* rather than *T. caries* was involved. The disease appears to be of limited distribution in Italy and is not a cause of great concern.

Batts (C. C. V.). **The control of loose smut in Wheat and Barley.**—*Ann. appl. Biol.*, 44, 3, pp. 437–452, 1 pl., 1 graph, 1956.

After stating that the increased amount of loose smut of barley (*Ustilago nuda*) [cf. 31, p. 324; 36, p. 175] and of wheat [*U. tritici*: 34, pp. 361, 516] in England recently appears to have been due mainly to successive wet years and to the increased popularity of susceptible varieties, especially spring barleys, the author describes experiments on control by the hot water treatment carried out at the National Institute of Agricultural Botany, Cambridge.

Wheat withstood higher temperatures than barley. After pre-soaking in cold water for four hours a draining period of three hours helped considerably in control. After a warm pre-soak (at about 90° F.) for four hours, the long drain was unnecessary. It was essential for the temperature of the grain in the hot tank to rise as rapidly as possible. In general, the higher the temperature at any stage, the greater the reduction in germination, reduction in vigour being reflected in the percentage germination after five days. Plants from hot water-treated seed emerged from the soil a few days after those from untreated seed, but after a week or two there was no apparent difference between them.

Infection in winter barley appeared to be the easiest to control: a cold pre-soak for four hours followed by 10 minutes at 124° to 126° was consistently effective. With spring barley, pre-soaking at 95° for four hours followed by 10 minutes at 124° to 126° gave complete control. For wheat the treatment recommended is pre-soaking at 90° for four hours followed by 10 minutes at 127° to 129°. In each treatment the grain is then cooled rapidly and dried. Tyner's recommendations for treatment with spergon and with water only [33, p. 78] were also tested. Neither method controlled infection in wheat, while in barley both treatments gave control, though with serious reduction in germination on some occasions. The best method of control, however, is by the use of resistant varieties.

Oertel (C.). **Untersuchungen zur Biologie des Gerstenflugbrandes (Ustilago nuda (Jens.) Kellerm. et Sw.).** [Studies on the biology of Barley loose smut (*Ustilago nuda* (Jens.) Kellerm. & Sw.).]—*Kühn-Arch.* 69, pp. 552–602, 6 figs., 6 graphs, 1955. [Russian, English, and French summaries. Received 1956.]

In studies at the Phytopathologischen Institut of the Martin Luther University, Halle-Wittenberg, Germany, spore germination of *Ustilago nuda* from barley [35, p. 438, *et passim*] was found to increase with relative humidity [cf. 11, p. 165] and with the stage of maturity of the spores.

The vacuum method of inoculation [cf. 30, p. 264] resulted in a rate of infection 20 per cent. higher than the hypodermic needle method [cf. 25, p. 30], 20 per cent. less winter killing and emergence injury, and 100 per cent. setting of seed as against 89 per cent. for the latter. This is apparently because infection by the vacuum method occurs as in nature, through the stigma [but see 34, p. 361].

Passage of an isolate from winter barley through summer barleys over a four-year period resulted in the pathogenicity to the test variety Mittlauer Hanna becoming comparable with that of a summer barley collection.

Nover (Ilse) & Mansfeld (R.). **Resistenzeigenschaften im Gersten- und Weizensortiment Gatersleben. 1. Prüfung von Sommergersten auf ihr Verhalten gegen Erysiphe graminis DC. f. sp. hordei Marchal. 2. Prüfung von Wintergersten auf ihr Verhalten gegen Erysiphe graminis DC. f. sp. hordei Marchal.** [Resistance in the Gatersleben Barley and Wheat collection. 1. Testing of summer

Barleys for reaction to *Erysiphe graminis* DC. f. sp. *hordei* Marchal. 2. Testing of winter Barleys for reaction to *Erysiphe graminis* DC. f. sp. *hordei* Marchal.] —*Kulturpflanze* (*Ber. Inst. KulturpflForsch.*), 3, pp. 105–113, 1955; 4, pp. 341–349, 1956.

In this series of physiological studies on the Gatersleben cereal collection at the Phytopathologischen Institut, Halle-Wittenberg, and the Institut für Kulturpflanzenforschung, Gatersleben, Germany, the resistance to fungal parasites is being dealt with first.

In 1954, 720 summer barley lines were exposed in field tests at Stichelsdorf bei Halle and Gatersleben to a widespread but not aggressive strain of race A of *Erysiphe graminis* [cf. 35, p. 761 and following abstracts] and to an aggressive strain of race C. In the greenhouse (22° C.), using races D_3 and C_4 on all lines and A_3 and B_5 on those which had received a rating superior to 2 to 3 (on a scale of 0 = no infection to 4 = very severe) in the field tests, 23 were resistant to all four races. Some of these, however, were more susceptible in the field when mature, the increase of infection being possibly attributable to an aggressive biotope of race C. Only the lines 261 and 810 (both Algerian C.I. 1179) and 805 (I 25), all belonging to the morphological group *hexastichon hybernum*, were rated immune from all four races. Of a further 21 lines, resistant to some but not all the races tested, several (Müllers Franken II, Strengs Franken III, Schweigers Erika, and Firlbecks III) shared the resistance to races A and D of their parent variety Pflugs Intensiv. Hanna Goldfoil and Da Caffé were also resistant to races A and D. Five lines, 143 (White Pearl), 333 (Zeiners Immune), 335 (Langenstein R 422/38), 339 (Japan 456), and 342 (Chiro Mugi) were resistant to the most aggressive race, C, but more or less susceptible to the other races.

Of the 225 winter barley lines subjected first to preliminary screening in the field and then, where possessed of some measure of resistance, to further tests in the greenhouse in 1955, six, all belonging to the morphological group *hexastichon hybernum*, were immune from or resistant (0 to 2) to all seven races used in the final tests (A_4, A_5, (B, F), C_3, C_4, D_1, and D_3).

Hänsel (H.) & Zakovsky (J.). **Röntgeninduzierte Mutanten der Vollkorngerste (Hordeum distichum nutans). I. Bestrahlung und Auslese auf Mehltauresistenz.** [Röntgen-induced mutants of Vollkorn Barley (*Hordeum distichum nutans*). I. Irradiation and selection for mildew resistance.]—*Bodenkultur*, 9, 1, pp. 50–64, 1956.

At the Probstdorfer Saatzucht-Station, Nieder-Österreich, Austria, seed of Vollkorn summer barley was subjected to X-rays in 1951, and the X_3 generation examined for resistance to artificial infection with mildew [*Erysiphe graminis*: see preceding and next abstracts], races A and B, under greenhouse conditions. Of 15,000 plants, 190 exhibited increased resistance, and 72 were also superior in field resistance in tests over two years.

Hänsel (H.) & Zakovsky (J.). **Mildew-resistant Barley mutants induced by X-rays.** —*Euphytica*, 5, 3, pp. 347–352, 1 graph, 1956. [Dutch summary.]

In this further note from the Probstdorfer Saatzucht Station, Austria, it is stated that one X_3 mutant (3502/53) from X-irradiated Vollkorn barley is resistant to races A, B, C, D, and F of *Erysiphe graminis* [see preceding abstracts]. In field trials in 1955 when mildew attack was rather heavy there was a correlation between lodging and susceptibility to mildew. Mutant lines with high yields (127 per cent. of that of the mother line) had good resistance to lodging and to mildew.

Moorhead (Ellen L.). **Serological studies of viruses infecting the cereal crops. I. A comparison of Barley stripe mosaic virus and Brome mosaic virus isolates**

by means of the complement-fixation technique.—*Phytopathology*, 46, 9, pp. 498–501, 2 graphs, 1956.

At the University of Nebraska, Lincoln, four isolates of brome mosaic virus [32, p. 674] were compared serologically with seven of barley stripe mosaic virus [36, p. 238]. Both viruses could be freed from contaminating plant material and concentrated by high-speed centrifugation; when purified they were stable serologically and at low temperatures (—20° C.) and were satisfactory for the production of rabbit anti-sera. For the latter purpose a mineral oil adjuvant was found to be preferable to physiological saline because fewer injections were needed, a higher titre was obtained, and a higher anti-body level maintained over a longer period of time, though this period was short compared with other viruses.

No cross reactions were noted between the two viruses, denoting them to be serologically distinct entities. The complement fixation technique [cf. 32, p. 699] showed no strain differences, indicating near or complete identity with the type strains.

Roberts (B. J.) & Moore (M. B.). **The effects of temperature on the resistance to Oat stem rust conditioned by the BC genes.**—*Phytopathology*, 46, 10, p. 584, 1956.

The Hajira type of resistance in oats to *Puccinia graminis* [cf. 36, p. 20] confers resistance up to 82° to 85° F. and is associated with the BC genes [33, p. 718]. At the University of Minnesota, St. Paul, oat leaves were inoculated with race 7 of *P. graminis* and the distal and proximal halves maintained at different temperatures (75° and 85°) to observe whether this resistance was due to a local or systemic reaction in the plant. The rust reaction of the four varieties used proved to be directly related to the temperature of the infection court; it is concluded that the effects of temperature on resistance are localized and that any substance responsible for this does not become systemic.

Williams (W.) & Verma (U. N.). **Investigations on resistance to disease among species of the genus Avena. II. Resistance to physiologic races of Puccinia coronata avenae and Puccinia graminis avenae.**—*Ann. appl. Biol.*, 44, 3, pp. 453–460, 1956.

In this further contribution to the present series of studies [34, p. 446], the authors describe investigations at King's College, Newcastle upon Tyne, in which the same collection of 53 species and varieties of *Avena* was inoculated with three cultures of *Puccinia coronata* from different sources and two of *P. graminis*. Resistance to some isolates of both species was shown by one sample of *A. strigosa* ssp. *strigosa* and two of ssp. *barbata*, but only one sample (No. 20 of ssp. *barbata*) displayed resistance to all five rust cultures. No. 20 had previously been shown to be resistant to two races of *Ustilago* [*avenae* and four of *U. kolleri*: loc. cit.]; but it is slightly susceptible to *Erysiphe graminis*. Genotypes with combinations of genes for resistance to a wide range of pathogens are, presumably, rare; also intraspecific variation in respect of these characters is so great that taxonomic classification cannot be used with certainty to discover sources of resistance to disease. The discovery of widespread resistance in a sample of the tetraploid ssp. *barbata* offers possibilities of transferring genes directly to cultivated species and dispensing with the synthesis of amphidiploid bridging forms.

The results demonstrate that resistance to the two rusts is not a clearly defined characteristic of any one *Avena* species. It must therefore be searched for as widely in wild or semi-wild species as in cultivated ones. The fullest utilization of resistance from related species demands a wide survey of distinct populations from each.

The reaction of the hexaploid variety, Richland, to stem rust was affected by temperature [cf. 35, p. 10; 36, p. 180 and preceding abstract], resistance to one

rust culture (X), isolated locally, breaking down completely at 70° F. The frequency of this temperature-dependent type of reaction emphasizes the need for strictly controlled conditions when identifying physiologic races. Furthermore, a source of resistance which sometimes permits infection by and sporulation of a pathogen must always be a danger in relation to the appearance of new races. A single-step mutation in the pathogen could give rise to new races pathogenic to the host under all conditions. If unaccompanied by other genetic forms of resistance, this type would seem to provide only a transient protection.

Silber (A[nni]), Mothes (K.), & Gröger (D.). **Über Misch-Sklerotien bei Claviceps purpurea Tul.** [Mixed sclerotia of *Claviceps purpurea* Tul.]—*Kulturpflanze* (*Ber. Inst. KulturpflForsch.*), 3, pp. 90–104, 1 pl., 1955.

Inoculation of rye [at the Institut für Kulturpflanzenforschung, Gatersleben, Germany] with a mixture of conidia of the pale strain (No. 156) of *Claviceps purpurea* [34, p. 224] and the violet strain (Gat IV) in equal proportions produced few pale sclerotia in the resultant harvest, most being violet and the remainder striped. Increasing the proportion of 'pale' conidia in the inoculum to 3:1 had no appreciable effect on the ratio. The harvests obtained from mixed inoculation of the pale strain with each of 16 violet strains supported the view that the extent to which a strain predominated in the sclerotia was an expression of its virulence. There was a fall in the yield from mixed infections as compared with single infections, especially marked with heavy-bearing violet strains [cf. 36, p. 97].

Leukel (R. W.). **Studies on Sorghum head smut.**—*Plant Dis. Reptr*, 40, 8, pp. 737–738, 1956.

In view of the increasing incidence of head smut (*Sphacelotheca reiliana*) of sorghum in the mid-western United States the author recapitulates a few details on the disease [cf. 5, p. 606; 6, p. 548]. In recent studies at Beltsville, Maryland, healthy Cody plants became infected after being transplanted from non-infested to infested soil, the age of the transplants ranging from two to nine weeks.

Scaramuzzi (G.). **Policarenza con sintomi di carenza di zinco, ed altre sintomatologie, su piante di Agrumi della riviera garganica.** [Multiple deficiency with symptoms of zinc deficiency, and other syndromes, on Citrus plants in the coastal region of Gargano.]—*Ann. Sper. agr.*, N.S., 10, 3, pp. 993–1006, 1 col. pl., 8 figs., 1956. [English summary.]

Three different sets of symptoms were observed in 1955 on orange and lemon trees growing in the Gargano region of Italy. The most widely prevalent condition was characterized by small leaves with the blades rolled inwards at the edges, while the leaf itself was curved backwards; the internodes were shortened and the foliage had a 'trussed up' appearance. The leaves bore interveinal, chlorotic, pale green to lemon yellow or white spots. Occasionally, almost the entire leaf blade was lemon yellow or white. After being sprayed with a mixture of commercial zinc sulphate, sodium carbonate, and adhesive in water the trees showed great improvement; this was more particularly marked when the mixture also contained magnesium and manganese. It is concluded that the symptoms were due to the associated deficiencies of zinc, magnesium, and manganese [cf. 35, pp. 775, 823].

Gunther (F. A.), Kolbezen (M. J.), Blinn (R. C.), Staggs (E. A.), Barkley (J. H.), Wacker (G. B.), Klotz (L. J.), Roistacher (C. N.), & El-Ani (A.). **Ammonium succinate and inorganic ammonia-producing materials as fungicides for the control of blue-green mold decay of Citrus fruits.**—*Phytopathology*, 46, 11, pp. 632–633, 1956.

This note records the results of further investigations at the University of

California, Riverside, on compounds suitable for the release of ammonia as a fungicide for the protection of stored citrus fruit against *Penicillium italicum* and *P. digitatum* [35, p. 13]. Of a number of compounds studied capable of slow hydrolysation in a humid atmosphere with the release of ammonia, ammonium succinate proved the most practicable on wounded inoculated oranges or in the cartons and is still under investigation. The ammonium salts of adipic, azelaic, caproic, pimelic, sebacic, and suberic acids and the ammonium salts of the acid esters of sebacic, suberic, malonic, and succinic acids also showed promise. Pellets of shredded asbestos with the compound or with mixtures of ammonium chloride or sulphate with calcium or magnesium oxide are also proving effective in the fruit cartons.

Knorr (L. C.). **Progress of Citrus brown rot in Florida, a disease of recent occurrence in the State.**—*Plant Dis. Reptr*, 40, 9, pp. 772–774, 1 diag., 1956.

Brown rot (*Phytophthora parasitica*) of citrus fruits [cf. 31, pp. 380, 604], first observed in Florida in 1951, caused 30 to 90 per cent. loss of crop there in 1953, but incidence has since been fairly low, though the disease has spread. It is liable to appear after heavy and persistent rains. In Hardee county in September, 1955, a brown-rot year, fruits remained wet for an average of 12 hours a day, compared with eight hours a day during the same period of the previous year when the disease did not occur.

Price (W. C.) & Knorr (L. C.). **Kinetics of thermal destruction of Citrus tissues in relation to the virus disease problem.**—*Phytopathology*, 46, 12, pp. 657–661, 5 graphs, 1956.

At the Citrus Experiment Station, Lake Alfred, Florida, a study was made of the thermolability of the tristeza and psorosis viruses of citrus [36, p. 185 and following abstracts] in relation to that of their hosts. Three inch lengths from older (0·8 cm. in diameter or less) rather than young budsticks of lime, lemon, orange, and grapefruit were immersed in a water bath over a temperature range from 35° to 52° C. for periods up to two hours, cooled in tap water, treated with 1 per cent. 8-hydroxyquinoline sulphate, and put up in ragdolls of similarly treated cheesecloth which were kept moist. Over the ensuing eight to ten days the appearance of small necrotic areas near to or in the buds was used as a criterion of death of the tissues. Budding to Pineapple sweet orange seedlings and Key [West Indian] lime was used to judge survival of psorosis and tristeza virus, respectively.

Both viruses survived as long as the buds over the range used, psorosis surviving 45° for 240 min. and 52° for 10 min., and tristeza 35° for three days, 45° for 180 min., and 52° for 30 min. The thermal killing of citrus buds may result from the destruction of a protein or enzyme system within the bud tissues. The theoretical and mathematical considerations of the expected survival of individual cells and buds are presented in detail. The results obtained indicate that both viruses might prove sufficiently stable *in vitro* for mechanical transmission, not achieved hitherto, to be possible, and for their concentration by suitable means.

Carpenter (J. B.). **Identification of tristeza in Meyer Lemon in Arizona.**—*Plant Dis. Reptr*, 40, 8, p. 701, 1956.

In a survey for citrus tristeza virus in Arizona, begun in 1955, investigations were confined mainly to Meyer lemon trees, owing to the high incidence of the virus in this variety elsewhere [35, p. 603]. Typical leaf symptoms developed on the Mexican lime indicators [see preceding abstract] budded with each of 41 lemon collections made. Where they came from old commercial groves, the virus was not apparent in adjacent trees of other varieties, although most older plantings were on sour orange rootstock [loc. cit.; 36, p. 185].

Reichert (I.) & Wincour (E.). **Inverse pitting in xyloporosis and tristeza.**—*Phytopathology*, 46, 10, pp. 527–529, 1 fig., 1956.

The writers review the literature on the various forms of pitting in citrus associated with xyloporosis and tristeza [36, p. 26 *et passim*], including the types known as inverse xyloporosis [14, p. 162] and honeycombing [34, p. 366], and discuss various interpretations of these [33, pp. 535, 671]. In the light of histological examinations at Rehovot, Israel, of specimens of both types from Florida and Israel they consider that these forms of pitting are not always the result of specific virus infections, and may possibly on occasion not be due to virus at all. Thus, they are not considered reliable diagnostic characters.

Knorr (L. C.). **Suscepts, indicators, and filters of tristeza virus, and some differences between tristeza in Argentina and in Florida.**—*Phytopathology*, 46, 10, pp. 557–560, 2 figs., 1956.

Investigations at the Tristeza Laboratory, Concordia, Argentina, and the University of Florida Citrus Experiment Station, Lake Alfred, showed the tristeza virus disease of citrus in Argentina [36, p. 99] to be distinctly different from tristeza or quick-decline virus disease of citrus in Florida [see preceding abstracts; 35, p. 512] though the latter is probably the same as the tristeza of California. By means of *Aphis citricidus* 39 species of local plants were tested, with the result that four new rutaceous indicator plants for tristeza, reacting similarly to Key lime (*Citrus aurantifolia*), were found in Argentina, namely *Afraegle paniculata*, *Pamburus missiones*, *C. hystrix*, and *C. combava*.

Whereas the Argentine tristeza virus produced vein clearing in *Aeglopsis chevalieri* [loc. cit.], severe stunting in *C. aurantifolia*, and marked wood pitting ('ropy trunk') in grapefruit [see preceding abstract], Florida tristeza virus gave no reaction with the first, did not stunt the second, and produced no stem pitting in the third. It is possible that *Aphis citricidus*, widespread in Argentina, but absent from Florida, may have caused a modification of the virus. The author's findings are in line with the suggestion of McClean and van der Plank [34, p. 640] that the term tristeza should be restricted to the complex of stem pitting and seedling yellows; the latter has not yet been found in Florida.

Olson (E. O.) & Shull (A. V.). **Exocortis and xlyoporosis—bud transmission virus diseases of Rangpur and other Mandarin-Lime rootstocks.**—*Plant Dis. Reptr*, 40, 11, pp. 939–946, 8 figs., 1956.

Studies at Texas Agricultural Experiment Station, Weslaco, and Rio Farms Inc., Edcouch, indicated that the causal organism of a bud-transmissible, bark-shelling disease of mandarin-lime rootstocks in Texas is identical with the exocortis virus of Rangpur mandarin-lime reported from Brazil [35, p. 180], and different from the xyloporosis [36, p. 99], psorosis [36, p. 185], and tristeza [see preceding abstracts] viruses.

Lemon and the mandarin-limes Rangpur, Ling Mung, Poak Ling Mung, Red Ling Mung [35, p. 764], Kusaie, and the CPB introductions 7418, 10557, and 72901 were susceptible to exocortis, but no symptoms developed on rough lemon rootstock. The virus was found in five of eight red grapefruit bud-source trees tested, one of four Valencia orange, and both of two Jaffa orange. Seedling Red Blush grapefruit, nucellar Valencia orange, and nucellar Ruby blood orange were not infected.

Outbreaks and new records. Jamaica.—*F.A.O. Pl. Prot. Bull.*, 5, 1, p. 14, 1956.

Information was received by the Department of Agriculture, Kingston, Jamaica, through the Caribbean Commission, Trinidad, to the effect that the roots of a large number of five-year-old coco-nut palms growing in rich alluvial soil in Jamaica

were dying back at or near ground level before they entered the soil. A very great reduction of roots resulted. A dark brown discoloration was present in the outer tissues in the base of the stem round the dying roots. Most of the roots had five or six separate growing tips burnt off, giving the ends a bunchy appearance. The discoloration of individual tips did not spread along the roots, but became sealed off. Cultures from affected material yielded several fungi, and further investigations into the cause of the condition are proposed.

Eighth Annual Report of the Research Department of the Indian Coffee Board (1954–55).—*Bull. Indian Coff. Bd Res. Dep.* 8, 94 pp., 2 pl., 1 graph, 1 map, 1956.

In the mycology section (pp. 77–85) of this report [cf. 35, p. 606] K. V. George states that in further spraying trials at the Coffee Research Station, Balehonnur, against coffee leaf disease (*Hemileia vastatrix*) [35, p. 765 and next abstract] there was no significant difference in the efficacy of Bordeaux mixture at three strengths, as evaluated by yield, although leaf counts in February, 1955, were higher with the most concentrated mixture (2–2–40) than with the least (1–1–40). In a comparison of various proprietary copper fungicides the yields following Bordeaux 2–2–40, cupravit (1 lb. per 40 gals.), wetcol-15 (3 lb.), and fungi-copper Geigy (1 lb.) were 3,081, 3,835, 3,723, and 1,780 lb. per acre, respectively. Counts of infected leaves indicated that control by Bordeaux was significantly superior to that achieved with perenox (1 lb.), and that mercurised copper oxychloride (2 lb. per 100 gals.) was better than Bordeaux. A low-volume Tee jet No. 65006 resulted in considerable economy of spray mixture as compared with a high volume nozzle, but more time was required to obtain a good, even coverage of the lower leaf surface.

In laboratory studies on the life-history of *H. vastatrix* uredospores germinated under favourable conditions in $1\frac{1}{2}$ to 2 hours. Germination was favoured by complete darkness, the presence of a film of water beneath the spores, and a neutral pH. Spores from fresh pustules gave a higher percentage germination than those from old lesions. Viability was lost after one month's storage under dry conditions, showing that fallen, infected leaves probably do not play an important role in the initiation of infection the following season.

D'Souza (G. I.). **Incidence and control of leaf-disease (Hemileia vastatrix, B. & Br.) of Arabica Coffee on the Bababudangiris.**—*Indian Coffee*, 19, 12, pp. 267–268, 1955.

The high incidence of leaf disease (*Hemileia vastatrix*) of coffee [see preceding abstract] on the Bababudangiris, India, in 1955, caused doubt as to the efficacy of spraying with 2–2–40 Bordeaux mixture in May and September only [14, p. 164]. A revised programme is recommended, involving additional sprays in August or November or both, according to locality and altitude.

Saccas (A. M.). **Les Rosellinia des Caféiers en Oubangui-Chari.** [The *Rosellinia* species of Coffee bushes in Ubangui-Chari.]—*Agron. trop., Nogent*, 11, 5, pp. 551–595; 6, pp. 687–706, 34 figs., 1956. [English and Spanish summaries.]

In the first part of this paper a full account is given of the following species of *Rosellinia* found on coffee in Ubangui-Chari, French Equatorial Africa, with reference to their geographical distribution, hosts affected, symptoms caused on coffee locally, microscopic characters, taxonomy, manner of spread and of penetration of the host, damage produced, and control: *R. bunodes* [27, p. 471; 35, p. 145]; *R. necatrix* [16, p. 454]; *R. pepo* [34, p. 518; 35, p. 171]; *R. arcuata* [11, p. 367; 19, p. 329; 35, p. 765]; *R. didolotii* n. sp.; and *R. megalospora* n. sp.

R. bunodes was first observed at Boukoko in 1954 on a dead *Coffea robusta* bush bearing conidia and perithecia. It is of frequent occurrence locally on dead coffee

bushes, commonly on *C. canephora* var. *robusta*; two fatal cases of infection of *C. excelsa* were found.

R. necatrix occurs on *C. excelsa* and *C. robusta* locally, especially in plantings in the forest zone situated in the south-east of Ubangui-Chari. Infection is eventually fatal.

R. arcuata was first found locally in 1955 in plantings in the forest region of Lobaye. Conidia and perithecia were present on several occasions on dead *C. excelsa* and *C. robusta* bushes and on decomposing fragments of these. At Boukoko perithecia were observed on *Cassia spectabilis*. Young coffee bushes are killed in a few months, though the disease progresses slowly in old plants. Infection is most rapid in weakened bushes; it is slower in the wet season and in humid localities. So far, the disease has occurred only sporadically, in a few old plantings; it causes very slight damage and is not, at present, of importance.

The pathogenicity of *R. didolotii*, found on dead trunks and dead, fallen branches of *Coffea robusta*, has not yet been established. *R. megalospora*, found on dead material of *C. excelsa*, is probably saprophytic.

The second part describes four new species (*R. mastoidiformis*, *R. coffeae*, *R. lobayensis*, and *R. echinocarpa*) found on dead branches lying on the ground. The list of references comprises 228 titles.

ECHANDI (E.) & SEGALL (R. H.). **Trunk, branch, and stem canker of Coffee trees.**—*Plant Dis. Reptr*, 40, 10, pp. 916–918, 4 figs., 1956.

Canker of coffee trees due to *Ceratostomella* [*Ceratocystis*] *fimbriata* [cf. 33, p. 80; map 91] has been observed in Costa Rica, where it is believed to have been present for a long time, though overlooked or confused with other diseases since it affects mainly old trees. Incidence increases with altitude, 60 per cent. of trees between 3,500 and 5,000 ft. being infected, and is also higher on farms with above average humidity.

ECHANDI (E.). **Inhibition of gemmae (cabecitas) production of Mycena citricolor on Coffee trees.**—*Plant Dis. Reptr*, 40, 9, p. 775, 1956.

Copper-containing fungicides have sometimes proved ineffective against cock's eye (*Mycena citricolor*) of coffee [36, p. 101] at the height of the rainy season in Costa Rica [35, p. 450]. Laboratory tests at the University of Costa Rica, San José, showed that mercury compounds inhibited the production of 'cabecitas' [stilboids] in the leaf spots, thus eliminating the source of primary inoculum. When spotted leaves were sprayed with or submerged in emmi, phix (phenyl mercury phosphate), or puratized agricultural spray [cf. loc. cit.], each at 1 gm. per l. plus a few drops of Du Pont spreader sticker, none of the lesions developed stilboids, compared with 62·4 per cent. on the untreated.

NOUR (M. A.). **A powdery mildew (Leveillula taurica (Lev.) Arn.) on Cotton in the Sudan.**—*Nature, Lond.*, 179, 4552, p. 218, 1957.

The occurrence of *Leveillula taurica* on young cotton plants [36, p. 186] in Khartoum Province during December, 1955, constituted a new host record for Africa. In cross inoculations to *Gossypium barbadense* (Domains Sakel and X 1730) and *G. hirsutum* sources of infection were shown to be broad bean and the weed *Euphorbia heterophylla*.

HULEWICZ (D.). **Wpływ porażenia słomy Lnianej przez rdzę i fuzariozę na ilość i jakość włókna.** [The effect on fibre yield and quality of Flax straw of infection by rust and fusariosis.]—*Wydaw. Przem. Lek. Spoż., 1955*, 4 pp., 3 figs., 1955.

Investigations in Poland indicated that there were no differences between healthy

flax straw and that infected by flax rust (*Melampsora lini*) in retting time, whereas in that attacked by wilt (*Fusarium lini*) [cf. 15, p. 279] the process was considerably shorter. Fibre yields from rust-infected straw were unaffected; wilted straw yielded more fibre although the proportion of long fibres was slightly lower. Fibre quality was slightly affected by rust and greatly impaired by wilt, though strength did not deteriorate. The author concludes that the manufacturing value of straw affected by rust (eight to ten spots per stem) was depressed by about 20 per cent., and by wilt, 50 to 60 per cent.

Orillo (F. T.). **An undescribed species of Helminthosporium on Kapok in the Philippines.**—*Philipp. Agric.*, 38, 8, pp. 548–550, 2 figs., 1955. [Received January, 1957.]

A disease of kapok (*Ceiba pentandra*), first observed in the Philippines at the College of Agriculture, Laguna, in 1952, is caused by *Helminthosporium ceibae*. It is more prevalent on the older leaves, yellow spots, up to 5 mm. in diameter, appearing on the leaf lamina. As the lesions enlarge the central portion becomes dark greyish-brown, and they may coalesce. The conidia are 4- to 10-septate, and 51·2 to 110·9 by 11·9 to 22·1 (average 83·75 by 18·05) μ.

Mendiola-Ela (Victoria) & San Juan (M. O.). **Leaf spot and stem rot of Abaca.**—*Philipp. Agric.*, 38, 4–5, pp. 251–271, 1 pl., 2 figs., 3 graphs, 1954. [Received January, 1957.]

A leaf spot of abaca (*Musa textilis*), first observed in the Philippines in 1952 and characterized by tiny, yellowish spots on the blade, later becoming black and coalescing into blotches, was found to be caused by *Helminthosporium torulosum*, the cause of stem rot of *M. textilis* [14, p. 312; cf. 35, p. 99]. A detailed account is given of the morphology of the pathogen, and of its behaviour in culture and in the field.

Umali (D. L.), Ick (F. R.), & Orillo (F. T.). **Reaction of varieties of Abaca and its relatives to vascular disease.**—*Philipp. Agric.*, 40, 3, pp. 115–119, 1956. [Received January, 1957.]

In inoculation studies from 1953 to 1955 at the Central Experiment Station, Laguna, Philippines, with 578 seedlings of abaca (*Musa textilis*) varieties and their hybrids, pacol × abaca hybrids, pacol, and canton, only the last named was resistant to vascular disease (*Fusarium oxysporum* var. [f.] *cubense*) [19, p. 707; cf. 34, p. 151] which has become prevalent in Davao. Destruction of diseased plants and draining of waterlogged plantations are recommended.

Celino (M. S.) & Martinez (A. L.). **Mechanical transmission of a mosaic virus from Abaca to Corn.**—*Philipp. Agric.*, 39, 7, pp. 379–392, 2 pl., 1955. [Received January, 1957.]

At the College of Agriculture, Laguna, Philippines, severe mosaic [? strain of cucumber mosaic virus: see next abstract] of abaca (*Musa textilis*) [35, p. 766], having been communicated to maize seedlings by *Aphis gossypii* [20, p. 65], caused severe mottling on *M. textilis* seedlings when re-transmitted by the same vector. However, mechanical inoculation of maize seedlings with this abaca mosaic by pin pricks induced in 8 per cent. of the plants a mild infection which, when re-transmitted by *A. gossypii* or *A. maidis* [20, p. 465; cf. 31, p. 118] to *M. textilis* caused a mild form of mosaic. The mild and severe forms appear to be distinct, the mild having an incubation period in *M. textilis* of 43 to 78 days, while that of the severe was 8 to 21 days, and only the former was transmissible mechanically. An abaca mosaic complex is therefore indicated.

Celino (M. S.) & Martinez (A. L.). **Mechanical transmission of the Abaca mosaic virus.**—*Philipp. Agric.*, 40, 3, pp. 120–128, 4 figs., 1956. [Received January, 1957.]

At the Central Experiment Station, Laguna, Philippines, in 1955–6, abaca mosaic virus [see preceding abstract] was transmitted to healthy abaca (*Musa textilis*), arrowroot, maize, and *Canna indica* seedlings by cutting a partly emerged infected leaf with a safety razor blade and then drawing the edge of the leaf to and fro gently against the leaves of the experimental plants after dusting them with carborundum 320. Although a low percentage of infection was obtained, the results showed that abaca mosaic virus is sap-inoculable, indicating that its transfer by aphids (*Rhopalosiphum nympheae*) is entirely mechanical.

It is suggested that consistent failure to transmit abaca mosaic to bananas mechanically or by vector [31, p. 119], confirmed in these studies by the author, is due to virus-host incompatibility.

Boneh-Borut (S.). **Inoculation experiments with Pestalotia versicolor Speg.**—*Bull. Res. Coun. Israel, Sect. D*, 5, 1, pp. 109–110, 1 fig., 1955.

Of 14 common garden plants inoculated at the Department of Botany, Hebrew University of Jerusalem, with *Pestalotia versicolor* [cf. 29, p. 412], the following five were parasitized (but only after wounding): *Acacia cyanophylla* (the most sensitive), *Dodonea viscosa*, *Euonymus japonica*, black poplar, and *Schinus molle*. Light brown zones of dead tissue formed, which later developed black acervuli. Oleander, on which *P. versicolor* was first found in Italy by Spegazzini, did not prove susceptible.

Holmes (F. O.). **Elimination of aspermy virus from the Nightingale Chrysanthemum.**—*Phytopathology*, 46, 11, pp. 599–600, 1956.

At the Rockefeller Institute for Medical Research, New York, a number of Nightingale chrysanthemums, a variety infected by both [tomato] aspermy virus [35, p. 18 and next abstract] and a mosaic-type virus [34, p. 456], were freed from the former by grafting scions 4 to 8 mm. long from the tips of branches on to healthy Good News chrysanthemums. Of 244 surviving scions tested by inoculation of young Turkish tobacco plants, 13 were free from the aspermy virus, though still carrying the mosaic-type virus.

Ocfemia (G. O.). **Experimental transmission of aspermy virus to Philippine Canna indica.**—*Philipp. Agric.*, 40, 1, pp. 624–626, 1 fig., 1956. [Received January, 1957.]

At the College of Agriculture, Laguna, Philippines, [tomato] aspermy virus, originally obtained from the Nightingale chrysanthemum [cf. 35, p. 298 and preceding abstract], was transmitted by *Myzus persicae* from tobacco to four out of over 100 *Canna indica* plants tested, constituting a new host record for this virus.

Baxter (L. W.) & Berly (J. A.). **Flower blight of Camellia in South Carolina.**—*Plant Dis. Reptr*, 40, 9, p. 831, 1956.

Flower blight of camellias (*Sclerotinia camelliae*) [35, p. 190] is reported from South Carolina, constituting a new record for the State. Some flowers, either lodged in branches or still attached, formed mature sclerotia *in situ*; periodic examination of plants and removal of such flowers as well as the fallen ones is recommended.

Jefferson (R. N.), Davis (Lily H.), Baker (K. F.), & Morishita (F. S.). **Spotting of Cymbidium flowers.**—*Bull. Amer. Orchid Soc.*, 23, 11, pp. 729–743, 4 pl., 1954. [Received December, 1956.]

This paper reports the results of studies at the University of California from 1952 to 1954 on the types, symptoms, necessary conditions for, varietal reactions to, and

control of spotting of *Cymbidium* flowers, by either *Botrytis cinerea* or mechanical injury, both of which cause much damage in southern California.

B. cinerea spotting is characterized by small or large irregular, brown to black spots or flecks with or without water-soaked margins or halos, while mechanical injury causes pimples, splotches, and spots with watersoaked halos. Both forms of injury can be largely prevented by protective housing and avoidance of overhead watering.

McClellan (W. D.). **A corm rot of Gladiolus caused by Rhizopus arrhizus.**—*Phytopathology*, 46, 12, pp. 687–689, 1 fig., 1956.

A light brown, soft rot was found liable to occur in gladiolus corms cured at 85° to 95° F. [33, p. 83], particularly at the higher temperature, humidity and injury augmenting the damage. It was attributed to *Rhizopus arrhizus* [cf. 34, p. 761]. Inoculations carried out in 1954 with a number of varieties under conditions favouring the disease at Beltsville, Maryland, gave the following percentages of rotted corms:—Picardy, 21·3; October Sunshine, 20·6; Spotlight, 14; Chamowny, 9·3; and Epic and Span, 5·3.

Glater (Ruth A. B.). **Smog damage to Ferns in the Los Angeles area.**—*Phytopathology*, 46, 12, pp. 696–698, 1 pl., 1956.

After briefly outlining the damage caused to various plants by smog [cf. 36, p. 48], attributed to intermediate peroxidic products resulting from the interaction of unsaturated hydrocarbons and the ozone in the atmosphere, the author gives an account of the symptoms of smog injury on ferns, which were quite distinct from those reported on other plants. Fern cells respond essentially like those of other plants [cf. 32, p. 478], but the extreme sponginess of the mesophyll allows rapid penetration of the toxins which cause widespread necrosis; the initial tan lesions (seen 24 hours after smog incidence) have extended within 48 hours to dehydration and necrosis of the whole leaf. Occasionally young plants may be killed.

Massey (L. M.). **Tests with fungicides for blackspot.**—*Amer. Rose Annu.*, 40, pp. 62–91, 1955.

At Cornell University, Ithaca, New York, spraying and dusting trials were carried out from 1950 to 1954, inclusive, for the control of black spot (*Diplocarpon rosae*) of roses [34, pp. 301, 580]. The plants were sprayed once or twice during the season with a spore suspension, two days after application of the fungicides, then kept wet by overhead irrigation for at least 12 hours. The fungicides were applied as a rule at weekly intervals, generally from early June to early October, the sprays at 200 to 275 lb. pressure, plastic screens intercepting drift. About ½ pint spray and ⅓ oz. dust were applied per plant. Full details are given of the results, some 30 or more compounds being tested. Maneb and zineb proved especially promising, also captan, glyodin, and karathane.

McWhorter (F. P.). **Viruses in the hybrid Lily L.T.A. Havemeyer.**—*Plant Dis. Reptr*, 40, 10, p. 904, 1956.

Inoculation studies at the Oregon Agricultural Experiment Station, Corvallis, showed that the L.T.A. Havemeyer hybrid lily is susceptible to the mottle virus complex [? strains of tulip breaking virus] but not to the *Lilium henryi* virus [cf. 30, p. 161]. As Havemeyer grows vigorously despite virus infection, which is probably present in all stocks, it can be planted where susceptible lilies or tulips are not present.

Pérez (J. E.), Adsuar (J.), & Sala (O.). **Tobacco mosaic virus in Orchids in Puerto Rico.**—*Phytopathology*, 46, 12, pp. 650–654, 1 fig., 1956.

Investigations were made at the University of Puerto Rico of the sap of *Cattleya*

spp. showing virus leaf symptoms and flower colour-breaking [34, p. 153]. Plant inoculations, precipitin tests, and electron microscopic examination indicated the presence of tobacco mosaic virus. Its presence is not, however, associated with any definite symptoms in *Cattleya*, and it is probably associated with other viruses, thus accounting for the varied symptoms observed.

Downie (D. G.). **Corticium solani, an Orchid endophyte.**—*Nature, Lond.*, 179, 4551, p. 160, 1957.

In germination tests the sterile mycelial form of *Corticium solani* isolated from the roots of the marsh orchid (*Orchis purpurella*) stimulated growth of the embryos and acted as a normal orchid endophyte. Isolates of *C. solani* from wheat straw, cauliflower, and tomato acted similarly, but not one from potato. A single plant of *O. purpurella* was observed with a collar-like fruit body of *Corticium* encircling the stem at soil level.

Mischke (W.). **Zikaden, Schildläuse und Blasenfüßler als Überträger von Viruskrankheiten im Zierpflanzenbau.** [Cicadas, shield bugs, and thrips as vectors of virus diseases in horticulture.]—*Pflanzenschutz*, 8, 12, pp. 169–170, 1956.

Information is summarized on the role of *Macrosteles levis* [? *M. divisus*] in the transmission of aster yellows virus (*NachrBl. dtsch. PflSchDienst, Berl.*, N.S., 7, p. 162, 1955); of *Orthezia insignis* in that of mosaic of *Epiphyllum truncatum* [12, p. 294]; and of *Thrips tabaci* as a carrier of tomato spotted wilt virus to a large number of ornamentals.

Diseases of fodder crops.—*Tasm. J. Agric.*, 17, 1, pp. 17–23, 6 figs., 1956.

The following diseases have recently increased in importance on fodder crops in Tasmania: common leaf spot (*Pseudopeziza medicaginis*), downy mildew (*Peronospora trifoliorum*), crown rot, probably due to *Sclerotinia trifoliorum*, and potassium deficiency of lucerne; leaf spot (*Mycosphaerella* [? *brassicicola*: cf. 25, p. 329]), and molybdenum deficiency of chou moellier [chou broccoli]; damping-off of rape; and black rot (*Xanthomonas campestris*) and boron deficiency of turnips.

Early cutting of lucerne for hay or silage and prompt removal of infected growth may suffice to control *P. trifoliorum* and *Pseudopeziza medicaginis*, but if necessary copper oxychloride or zineb may be applied at 3 to 4 lb. in about 30 gals. water per acre. Copper oxychloride is also tentatively recommended against crown rot. Potassium deficiency should be controlled by application of 2 to 3 cwt. potash per acre when preparing for a new stand. Immersion of chou broccoli seed for 30 minutes in water at 122° F. is effective against leaf spot, and rotation with non-cruciferous crops is recommended. Molybdenum deficiency should be controlled by prior application of molybdenized superphosphate, but crops may, if necessary, be sprayed with 1 oz. ammonium molybdate in 12 gals. water plus a wetting agent. Damping-off of rape can be controlled only by seed treatment with thiram. Hot water treatment of the seed as for leaf spot is effective against *X. campestris* on turnip and even distribution of boron, well crushed and mixed with a bulky fertilizer, is recommended against boron deficiency.

Sprague (R.). **Some leafspot fungi on western Gramineae. X.**—*Mycologia*, 48, 5, pp. 741–756, 1 fig., 1956.

In this contribution to the present series [35, p. 611] descriptions are given of new or noteworthy fungi collected chiefly in Alaska, the south-western United States, the Olympic National Park, Washington, and the Wallowa Mountains, Oregon. The fungi described include *Phyllosticta digitariae* n. sp. on *Digitaria ischaemum*; *Colletotrichum graminicola* on *Poa stenantha* and *Glyceria pauciflora*; *Helminthosporium* [*Pyrenophora*] *tritici-repentis* on *Elymus glaucus*; *H. vagans*

on *Poa trivialis* and *P. palustris*; *Septoria anthoxanthina* on *Anthoxanthum odoratum*; *Selenophoma donacis* var. *linearis* on *Festuca reflexa*; and *H. stenacrum* on *Agrostis thurberiana*.

Mackay (J. H. E.) & Brockwell (J.). **A comparison of two fungicides for control of dollar spot.**—*J. Aust. Inst. agric. Sci.*, 22, 3, pp. 206–207, 1956.

In a trial conducted at the Royal Canberra Golf Club, *Agrostis tenuis* and *Festuca rubra* var. *fallax* were sprayed for the control of 'dollar spot' (*Sclerotinia homoeocarpa*) [35, p. 161] from October, 1953, to March, 1954, omitting mid-December to the end of January, when the disease is not usually present, with P.A.C.A. [loc. cit.] (0·1 per cent. aqueous solution) and actidione (0·09 gm. acidione+2·16 gm. ferrous sulphate in 6·72 l. of water), each applied fortnightly at 50 gals. per 600 sq. yds., the controls being sprayed with water.

The disease appeared on 26th January, followed a normal course for four weeks, and reached epidemic proportions during March. Incidence was recorded weekly (percentage of 4 in. squares affected in an area three feet square) and at its worst was 32·47, 31·98, and 25·06 per cent. in the control, actidione, and P.A.C.A. plots respectively. P.A.C.A. was less satisfactory than previously reported [31, p. 609], and the spray programme requires to be adjusted to each particular outbreak.

Dewey (W. G.) & Tyler (L. J.). **Dwarf bunt on Ryegrass in New York.**—*Plant Dis. Reptr*, 40, 6, p. 508, 1956.

Tilletia controversa, not previously recorded on *Lolium* spp., was observed in 1955 on *L. perenne* and *L. multiflorum* growing among winter wheat plants in an experimental field nursery maintained by Cornell University for studies of dwarf bunt.

Meiners (J. P.). **Effect of method of inoculation on control of head smut of Mountain Brome by seed treatment.**—*Plant Dis. Reptr*, 40, 8, pp. 734–736, 1956.

At Pullman, Washington, ceresan M (dust or slurry, 1 oz. per bush.) was the only effective seed disinfectant of several tested for the control of *Ustilago bullata* on mountain brome grass [*Bromus marginatus*] when the seed was heavily inoculated by the partial vacuum method used in some previous experiments [32, p. 630; 33, p. 301]. With naturally infected seed, however, equally good control was given by arasan SF-X slurry, arasan dust (both 4 oz. per bush), and agrox slurry and dust (both 1 oz.), all the treatments reducing the percentage head smut from 98·5 (untreated) to 0·6 or less. These materials are, therefore, again recommended, arasan being particularly valuable as it can be applied without danger of injury to the seed.

Johnston (Margot E. H.). **Bacteriosis, a disease of Cocksfoot.**—*N.Z. J. Agric.*, 93, 5, p. 443, 1 fig., 1956.

Bacteriosis, or Rathay's disease [*Corynebacterium rathayi*: 25, p. 118], of cocksfoot [*Dactylis glomerata*] caused various degrees of withering and distortion of the emerging panicles during a seed production trial at Milson, near Palmerston North, New Zealand, in October and November, 1955. In New Zealand the disease appears to be of minor importance in reducing seed yield. Of the samples examined from 65 crops, 4 were free from infection, ten had 0·2 per cent. of the panicles moderately infected, and only one contained a severely infected head. The average percentage of heads showing a trace to slight infection was 6·5.

White (N. H.), Cass-Smith (W. P.), & Harvey (H. L.). **Wart disease of Subterranean Clover.**—*J. Aust. Inst. agric. Sci.*, 22, 3, pp. 204–205, 2 figs., 1956.

At Talbot Brook, Western Australia, the Dwalganup, Yarloop, and Mount Barker varieties of subterranean clover are affected by wart disease (*Physoderma trifolii*) [cf. 30, p. 125], this being a first record of the disease in Australia and a first

record on this host. The outbreak was associated with heavy rainfall and, in the three worst areas, with soil saturation over prolonged periods.

Wells (H. D.), Forbes (I.), Webb (T. E.), & Edwardson (J. R.). **Two Stemphylium diseases of Blue Lupine.**—*Plant Dis. Reptr*, 40, 9, pp. 803–806, 7 figs., 1956.

'Little' leaf spot of blue lupin (*Lupinus angustifolius*) caused by *Pleospora herbarum* was observed for the first time in the United States at the North Florida Experiment Station, Quincy, in 1954. The circular, light brown leaf lesions, up to 1 mm. in diameter, were shallow, 20 to 30 being visible on the upper and only one or two on the lower surface. There were also small, triangular to circular pod lesions up to 4 mm. and much larger stem lesions. Outbreaks later occurred at Gainesville, Florida, and in Georgia; near Albany a ten-acre planting was completely killed. Infection was serious only in plantings adjacent to lucerne [36, p. 248], and symptoms were reproduced in the greenhouse in cross-inoculations with isolates from the two hosts. White and yellow lupins (*L. albus* and *L. luteus*) were not susceptible. The disease is probably identical with that attributed to *Macrosporium* [*Stemphylium*] *sarciniforme* in Germany [18, p. 116] and Italy.

Grey leaf spot of blue lupin, caused by *S. solani*, apparently a new host record, was observed near Albany in 1956 and later in other localities in Georgia and at Gainesville and Quincy. Leaf lesions were at first kaffa brown, the central portion becoming rose-grey. Stem and pod lesions were dark brown or cinnamon, sometimes extending around the stem or involving the entire pod. The disease caused almost complete defoliation in some plantings. Inoculated yellow and white lupins were not susceptible.

Sackston (W. E.). **Observations and speculations on rust (Puccinia helianthi Schw.) and some other diseases of Sunflowers in Chile.**—*Plant Dis. Reptr*, 40, 8, pp. 744–747, 1956.

Rust (*Puccinia helianthi*) [map 195; 36, p. 189], powdery mildew (*Oidium* sp.: presumably *Erysiphe cichoracearum*) [cf. 29, p. 191], and *Sclerotinia minor* [cf. 19, p. 320] were discovered on sunflower in Chile in 1954, constituting new records for that country.

Fruit tree raising.—*Bull. Minist. Agric., Lond.*, 135, vi+50 pp., 24 pl., 6 figs., 1956. 5*s*.

This well-illustrated booklet on fruit tree cultivation, intended mainly for the benefit of modern commercial growers, contains a chapter (pp. 41–46) on control of pests and diseases in the nursery and another (pp. 47–48) on virus diseases. Appendices II and III (p. 49) deal, respectively, with the volume and concentrate required for dilute tree washes and with the Sale of Diseased Plants Orders of 1927 to 1943.

Current research, investigations, experiments.—*Orchard. N.Z.*, 29, 11, pp. 11, 13, 1956.

Observations in trial work at Mt. Albert, New Zealand, revealed the occurrence of the natural spread of apple mosaic virus [33, p. 33] in the field. Measurements of trunk circumference show that a severe strain of the virus markedly reduces growth in the early years, a mild strain often protecting trees against infection by a severe strain. Blocks of Jonathan trees infected by a mild strain can yield over 1,000 bush. per acre. In heat treatment tests on small trees of Jonathan, Red Jonathan, Ballarat, and Golden Delicious to free them from apple mosaic, some survived 40 days at 100° F. The fact that roguing of the old stool beds has greatly reduced incidence of the virus lends support to the theory that new beds can be

kept almost disease free. Although natural spread may prevent complete elimination, incidence can be reduced to a very low level.

Nursery infection of plum and peach with bacterial spot [*Xanthomonas pruni*: 32, p. 322] is presenting a more serious aspect of the disease. Regular applications of agrimycin sprays have given poor results and there are some indications that more sprays are required during early spring and that timing should be determined by weather conditions rather than by the calendar.

Blast [*Pseudomonas syringae*: see below, p. 331] in young stone-fruit nursery trees at Levin was reduced from 60 to 2 per cent. by a full programme of streptomycin sprays. It has been possible to replace winter streptomycin sprays by Bordeaux mixture with a considerable reduction in cost and no loss of efficiency. In a trial in 1950 at Roxburgh regular winter applications of Bordeaux mixture at monthly intervals to young apricot trees gave good control of the disease.

Manganese [35, p. 614] and magnesium deficiencies are widespread in the citrus districts.

Spurling (M. B.) & Cowley (R. W. I.). **Blackwood Experimental Orchard—a progress report, 1955–56.**—*J. Dep. Agric. S. Aust.*, 60, 5, pp. 202–206, 1 pl., 1 fig., 1956.

In field trials at the Blackwood Experimental Station, South Australia, for control of apple scab [*Venturia inaequalis*: cf. 36, p. 192] incidence was low on all trees except the unsprayed. There was little difference in fruit scab incidence on treated trees (Granny Smith and Cleopatra) given the standard schedule or one incorporating TMTD (1½ lb. per 100 gals.), PMF (8 oz. followed by 4 oz.), tuzet (2 lb.), SR 406 [captan] (1½ lb.), glyodin (2½ pints plus lime), or ½ TMTD plus ½ PMF. Trees receiving glyodin and captan remained particularly healthy, with excellent leaf colour, throughout the season. TMTD caused leaf distortion and curling until petal fall, Granny Smith being severely and Cleopatra slightly affected.

The addition of triton B 1956 in spray tests on Jonathan, Dunn's Seedling, and Granny Smith improved coverage by causing film deposits instead of droplet type residues, but excess spray run-off and foliage injury (when the sprays used were slightly phytotoxic) were increased. There was no significant difference between the effectiveness of full strength concentrates with or without triton and half strength with triton.

Prune rust [*Puccinia pruni-spinosae*: cf. 35, p. 687] on prune plums was effectively controlled (commercially) by treatment with Bordeaux mixture at bud burst followed by wettable sulphur in mid-October and mid-December. TMTD was equally effective but more expensive.

Martin (D.) & Cerny (J.). **Low oxygen gas storage trials of Apples in Tasmania.**—*Tech. Pap. Div. Plant Ind. Commonw. sci. ind. Res. Org., Aust.*, 6, 19 pp., 1 fig., 1956.

Conventional gas storage mixtures containing 5 per cent. carbon dioxide and 16 per cent. oxygen having caused increased sensitivity to scald and breakdown in various Tasmanian apple varieties [cf. 35, p. 104], studies at the Tasmanian Regional Laboratory, Hobart, showed that at 31° to 32° F. low oxygen concentrations (around 3 per cent.) in the absence of carbon dioxide reduced wastage in the Cox, Cleopatra, Granny Smith, Delicious, Golden Delicious, Tasman Pride, Geeveston Fanny, Jonathan, Democrat, Legana, and Sturmer varieties and in Packham's Triumph pear. The behaviour of each variety under the treatment is described. The treatment was effective against breakdown, scald, and core flush, but inferior to carbon dioxide storage as regards Jonathan spot and pit (though still superior to air storage). Colour changes were affected according to variety, sometimes being retarded, but in no case seriously. No 'off' flavours developed and a

week was sufficient for the normal flavour (poor on removal from storage) to develop. Packham's Triumph pear kept better than in air (but no better than in carbon dioxide storage) and ripened normally.

The alternative use of plain and oiled wraps gave varying and inconclusive results.

McGlasson (W. B.). **Some common storage disorders of Apples and Pears.**—*J. Dep. Agric. S. Aust.*, 60, 5, pp. 207–219, 13 col. pl., 1956.

Concise descriptions are given of the following non-parasitic disorders commonly encountered in stored apples and pears in South Australia [cf. 29, p. 314]: deep scald, Jonathan spot or sugar spot, low temperature breakdown, superficial scald of (*a*) coloured and (*b*) green varieties, sunburn scald, bitter pit, hollow core breakdown, early watercore, and late or radial watercore of apples; also core breakdown, skin scald, and freezing injury of pears [cf. preceding abstract]. There are brief notes on control, and each disorder is illustrated in colour.

Mezzetti (A.). **La 'plara' delle Mele. I. Osservazioni e ricerche sulla morfologia dell'alterazione.** ['Plara' of Apples. I. Observations and researches on the morphology of the disorder.]—*Ann. Sper. agr.*, N.S., 10, 2, pp. 471–494, 8 pl., 1 fig., 1956. [English summary.]

In Emilia, Italy, the dialect word 'plara' has been used to denote two distinct skin disorders of stored apples, a lenticel rot caused by *Gloeosporium riessii* [33, p. 676] and a condition of non-parasitic origin to which it is suggested that the term 'plara' [see next abstract] should be confined. The lesions typical of non-parasitic 'plara' are brown, isodiametric, sunken, dry, and leathery; they have steep edges and a lenticel at the centre, and occur chiefly on the calyx half of the fruit. They are rather shallow and are frequently connected with one to two subepidermal terminals of vascular bundles. Their collapsed tissues usually contain starch grains. Other dead, starch-containing cells scattered in the flesh of affected and (more sparsely) healthy fruits may be homologous with the 'plara' pits.

The lesions first appear at the beginning of the harvest (early in October for the most susceptible variety, Abbondanza), continue to develop until the end of January, and often show initially through the skin. The most probable hypothesis is that they originate internally and are related to sap movement, the drying up of the tissues through the lenticels promoting their development.

Mezzetti (A.). **La 'plara' delle Mele.** ['Plara' of Apples.]—*Frutticoltura*, 17, 2, pp. 123–135, 17 figs., 5 graphs, 1956.

Preliminary studies in the field and at the University of Bologna Experimental Laboratory of Plant Pathology, Italy, indicate that physiological 'plara' of apples [see preceding abstract] is increased by heavy pruning and reduced by light pruning. Susceptibility decreases with increasing age of the tree. Fruit kept in ordinary storage is more severely affected than that in cold storage. Most of the spots (including those that develop in cold storage) appear in December and January.

Smith (W. W.), Barrat (J. G.), & Rich (A. E.). **Dapple Apple, an unusual fruit symptom of Apples in New Hampshire.**—*Plant Dis. Reptr*, 40, 9, pp. 765–766, 1 fig., 1956.

The name 'dapple apple' is suggested for a disorder first observed on Cortland apple trees in New Hampshire in 1953 and on McIntosh in the same orchard in 1954. The symptoms, which are more pronounced on Cortland, have been observed only on trees with Virginia Crab or Robusta V bodystocks. As the fruit matures, circular areas remain green and slightly flattened. In storage, the affected areas turn yellow. The cause is unknown.

Foschi (S.). **Cascola dei frutti, ipertrofia delle 'borse', e 'sfogliatura' dei peduncoli e dei rami di Melo provocati da eccesso di umiditá.** [Fruit drop, hypertrophy of the 'cheeks' and 'papery bark' of the peduncles and branches of Apple caused by excess of humidity.]—*Ann. Sper. agr.*, N.S., 10, 2, pp. 427–437, 9 figs., 1956. [English summary.]

In October, 1953, Rambour Frank apple trees growing in northern Italy, especially in Emilia and the Romagna, developed a withering of the fruits, which fell prematurely. The peduncles of the affected fruits developed papery bark, and the cheeks of the fruits became greatly swollen. In the spring of 1954 Delicious and Stayman trees growing in the same localities also developed papery bark of the branches.

A study of the environmental conditions prevailing locally at the time, and of the anatomy of the affected parts indicated that the condition was due to excessive air humidity and soil moisture.

Bolay (A.). **Observation en Hollande de la forme parfaite du champignon Gloeosporium perennans Zeller et Childs.** [Observation in the Netherlands of the perfect state of the fungus *Gloeosporium perennans* Zeller and Childs.]—*Tijdschr. PlZiekt.*, 62, 6, pp. 322–324, 2 figs., 1956. [Dutch and English summaries.]

Apothecia were found in the Netherlands in 1956 on apple trees naturally infected with *Gloeosporium perennans* and on others inoculated one year previously with the same fungus. Their formation was probably favoured by the unusually wet summer of 1955.

The author determines the perfect state as *Neofabraea malicorticis* [15, p. 74], considering the difference between this species and Kienholz's *N. perennans* [19, p. 226] to be too small to sustain the latter.

Wade (G. C.) & Ward (J. R.). **The influence of fungicides and fruit maturity on the development of ripe spot and target rot of Apples.**—*J. Aust. Inst. agric. Sci.*, 22, 3, pp. 198–203, 1956.

In further work on the control of ripe spot and target rot of Sturmer apples in Tasmania [32, p. 436; cf. 34, p. 375], now known to be caused by *Gloeosporium album* [cf. 35, p. 901], a lime-sulphur-colloidal sulphur spray schedule gave no significant control. Applications of thiram or captan early in the season gave good control on the tree, but infection developed in storage unless the treatment was continued for all three cover sprays. Evidently, infection can take place during a considerable part of the season, and it is suggested that while these fungicides may directly prevent it, they also delay maturation of the fruit, making it more susceptible to latent infection.

Early picking greatly reduced losses in storage, but when fruit picked early and late was stored at atmospheric temperature the early-picked developed more infection in relation to the late-picked (59·6 and 86 per cent. respectively) than when the apples were placed in cool storage (for six months) immediately after picking, when the comparable figures were 3·6 and 16. This difference, however, was reduced when the fruit, after cool storage, was held at atmospheric temperature for four weeks (8·7 and 24·2). Cold storage probably delays maturity changes which affect fruit susceptibility.

Guengerich (H. W.) & Millikan (D. F.). **Transmission of the stem pitting factor in Apple.**—*Plant Dis. Reptr*, 40, 11, pp. 934–938, 5 figs., 1956.

At the Missouri Agricultural Experiment Station, Columbia, the virus nature of the disease causing stem pitting of Virginia Crab apple interstocks [cf. 35, p. 686] was confirmed when symptoms developed on healthy trees of this variety inoculated

with budwood of Golden Delicious, Early Harvest, and Winesap from affected trees. Most apple varieties appear to be resistant, Virginia Crab having proved so far the best indicator.

Fulton (R. W.). **Non identity of Apple mosaic and Tobacco streak viruses.**—*Phytopathology*, 46, 12, p. 694, 1956.

In an investigation at the University of Wisconsin, Madison, of Yarwood's apple mosaic virus, believed to be a strain of tobacco streak virus [35, p. 902], it was found that symptomless tobacco leaves, 'recovered' from tobacco streak, when inoculated with apple mosaic developed local and systemic symptoms as on the control plants. Similarly tobacco leaves 'recovered' from apple mosaic were not protected against tobacco streak. Tobacco streak could not be transmitted to apple seedlings by *Cuscuta campestris*. The lack of cross protection indicates that apple mosaic virus, though possibly similar to it, cannot be regarded as a strain of tobacco streak virus.

Jaarverslag 1955 Proefstation voor de Fruitteelt in de volle grond. [Report for 1955 of the Experiment Station for Outdoor Fruit Culture.]—72 pp., 18 figs., 1 diag., 3 graphs, 1956. [English summary.]

No decision could be reached by G. S. Roosje regarding the efficiency of Mills's spray-timing method in relation to apple and pear scab control [35, p. 302] on the basis of inoculation experiments with ascospores and conidia of *Venturia inaequalis* and *V. pirina* at low temperatures in 1955 at the Experiment Station for Outdoor Fruit Culture, Wilhelminadorp bij Goes, the Netherlands. Conidial germination and the resultant infection did not appear to be significantly reduced by a two- to four-hour dry spell between two wet leaf periods which together were long enough to provide the necessary conditions for fungal entry. Aaventa, alvesco, hostakwik, and venturicide [35, p. 691], applied to James Grieve, Cox's Orange Pippin, Jonathan, and Golden Delicious apple trees in the field between 68 and 110 hours after infection on 12th April, 3rd, 20th, and 31st May, and 15th June, were equally effective in scab control. Captan gave as good results in the elimination of scab from Transparente de Croncels pears as from Beauty of Boskoop apples, five treatments between 21st April and 16th June reducing the incidence of fruit infection from 16·5 to less than 0·1 and from 36·4 to 0·8 per cent., respectively. The addition of active carbon (norit) to organic mercurials as an absorbent is not recommended. Applied shortly after flowering, nirit (dinitrorhodanebenzene) [cf. 30, p. 374 *et passim*] caused roughening of the fruits of the above-mentioned pear and apple varieties.

In a field trial for the control of apple mildew (*Podosphaera leucotricha*) [35, p. 901] on Jonathans, 0·5 per cent. SM 55 (a mixture of captan and thiovit wettable sulphur) was equal in efficiency to 0·4 to 0·5 per cent. thiovit alone. Comparable results were obtained with 0·1 per cent. karathane [36, p. 258].

Kienholz (J. R.). **Control of bull's-eye rot on Apple and Pear fruits.**—*Plant Dis. Reptr*, 40, 10, pp. 872–877, 1 fig., 1956.

Studies at Hood River, Oregon, on bull's-eye rot (*Neofabraea malicorticis* or *N. perennans*) [19, p. 226] of apple and pear in cold storage demonstrated that infection of apple fruits may occur very early in the season and remain latent until the fruits mature. Preliminary fungicide trials showed that ziram, dichlone, and captan at 1 in 100,000 were equally effective in preventing germination of conidia, and as a result of field tests carried out from 1951 to 1954, mostly on apples, ziram [35, p. 508] is recommended for its safety in mixed plantings of apples and pears, its compatibility with most insectides, and its value for the control of scab [*Venturia inaequalis* and *V. pirina*] early in the season. No repacking because of fruit

rot was necessary after 1952, when ziram was first used commercially. An application at 1½ lb. to 100 gals. water is recommended with the first cover spray for codling moth control and a second before the autumn rains. One or more additional sprays may be advisable if excessive rainfall occurs during the season.

Posnette (A. F.). **Virus diseases of Pears in England.**—*J. hort. Sci.*, 32, 1, pp. 53–61, 3 pl., 1956.

Following studies at East Malling of virus diseases of commercial stocks of pears and of quince rootstocks the author classifies the symptoms of virus infection in pear and related species [cf. 35, p. 831] in England, in addition to stony pit [32, p. 386], into five groups, viz., (1) mosaic, comprising greenish-yellow, chlorotic patterns, usually associated with the veins, but not typical veinbanding, the symptoms varying in intensity and being especially marked on Beurre Hardy and Doyenne d'Été; (2) vein yellows, a narrow yellow banding, particularly of the tertiary and smaller veins, seen on many varieties and most commonly on young trees; (3) red mottle, a dark red or bronze veinbanding and flecking, developing on mature leaves from July onwards, especially just prior to autumn coloration; (4) quince veinbanding, a broad, light green veinbanding of quince trees, which in one tree of the clone Quince C, a common pear rootstock, was associated with a virus infection distinct from that causing pear mosaic (the Quince C virus, referred to as 'quince stunt virus', does not usually cause leaf symptoms either in Quince C or in pears); and (5) hawthorn ring pattern, a ring and veinbanding pattern on a naturally infected hawthorn (*Crataegus oxyacantha*) caused by a virus transmissible to quince, on which it produced symptoms differing from those produced by pear mosaic and quince stunt viruses.

In addition to these, another type of symptom appeared when seedlings of Quince E, the most reliable indicator, were budded with two pear varieties showing red mottle, or in one case from Bristol Cross pear, with no symptoms. This was termed sooty ring spot, because of the black pigment in the epidermis, simulating sooty mould, often ringing pale yellow spots, and being accompanied by vein yellowing and necrosis.

Mosaic, vein yellows, and red mottle occur on pear: stunt and sooty ring spot occur on quince, the viruses being latent in the pear. The high incidence of infection with these diseases, which is estimated to cause an overall fruit loss of 15 to 20 per cent., is attributed to the use of infected material for propagation. From the failure of virus-free experimental stock to become infected, though growing close to infected stock, it is assumed that vectors play no part in transmission.

Mallach (N.). **Eine neue gefährliche Form der Bandchlorose auf Reneklode.** [A new, dangerous form of band chlorosis on Greengage.]—*Pflanzenschutz*, 8, 12, pp. 170–171, 5 figs., 1956.

The severe form of band mosaic [35, p. 372] herein reported from the Bavarian Institute for Agriculture and Plant Protection, Munich, involved the leaves of an Althans greengage, which bore extensive necroses, mostly at the periphery of the chlorotic pattern. The virus was successfully inoculated into plum.

Grosjean (J.). **Jaarlijkse periodiciteit in de parasitaire activiteit van Stereum purpureum.** [Annual periodicity in the parasitic activity of *Stereum purpureum*.] —*Tijdschr. PlZiekt.*, 62, 5, pp. 226–235, 1 fig. (facing p. 224), 2 graphs, 1956. [English summary.]

To determine whether the spread of *Stereum purpureum* in resistant plum varieties is slower than in susceptible ones and is eventually arrested by a gum barrier, branches of the resistant Ontario and susceptible Victoria were inoculated in the springs of 1947 and 1949 at the Phytopathological Research Institute, Wageningen,

the Netherlands [28, p. 631], and the longitudinal growth rate determined by monthly reisolations. The growth rate of the fungus was found to be the same in both varieties. During the very warm summers following inoculation, reisolation from the wood proved to be very difficult or even impracticable in August and September. Brown, decayed areas were visible in the wood but no formations suggestive of gum barriers.

Further inoculation experiments in September, 1952, on branches of the Czar variety confirmed that *S. purpureum* undergoes a period of inactivity during the summer.

Growth began during the autumn and was succeeded by a dormant period until the following March. Reisolations could then be made until July, when they began to fail; a few were successful in October and November, but not until December could the fungus be recovered from the entire length of the wood. Although the leaves were silvered the growth of the branches was not checked to any extent. Dark zones appeared in November, but shortly afterwards decay began to spread outside them, and it is concluded that they do not impede but merely indicate the temporary cessation of fungal growth.

Reisolations were made throughout the summer of 1954, by which time the branches were severely injured or dead. Hence the inactive period observed in the first summer of the tests resulted from enhanced resistance of the tree, possibly induced by the movement of carbohydrates from the foliage to the wood, where a sufficiently high concentration in the summer may inhibit the fungus. Acting on this supposition, carbon dioxide assimilation should be promoted by reasonably wide spacing and summer pruning to give free access of light to the leaves and by correct fertilizing, including the provision of iron and manganese to overcome soil deficiencies causing chlorosis.

Sprague (R.) & Figaro (Peggybeth). **Rusty spot, powdery mildew, and healthy skin of Peach fruits compared histologically.**—Abs. in *Phytopathology*, 46, 11, p. 640, 1956.

Rusty spot of peaches [26, p. 249], the cause of which is unknown, was shown by microscopic examination not to comprise sterile lesions of mildew (*Sphaerotheca pannosa*) [35, p. 375], as has been suggested. In the rusty spots there is an increase in lignified skin tissue, trichomes, and sub-epidermal chloroplasts.

Dye (M. H.). **Recent work with horticultural formulations of streptomycin.**—*Orchard. N.Z.*, 29, 11, pp. 2–3, 1956.

In studies so far on the control of blast (*Pseudomonas syringae*) of stone fruits [36, p. 36] in New Zealand with streptomycin the bacterium has shown no signs of resistance under field conditions. There was no detectable difference between streptospray and agrimycin in field control of the disease. In tests at Auckland, Nelson, and Alexandra there were no toxic reactions during rapid growth in spring following 100 and 250 p.p.m. sprays on Moorpark, Oullin's Early, or Roxburgh Red apricots, Twyford cherries, Yellow Magnum Bonum plums, Muir or Blackboy peaches, Winter Cole pears, or Jonathan or Sturmer apples. The 500 p.p.m. spray resulted in temporary yellowing of the margins of young, partly developed leaves of Twyford cherries and Jonathan and Sturmer apples, but not of mature leaves. Streptospray at 100 p.p.m., applied during bloom, did not damage the flowers of the above-mentioned varieties except those of Yellow Magnum Bonum plums, which suffered a slight petal burn. Neither antibiotic reduced fruit set in Moorpark apricot or Muir or Blackboy peach following one bloom spray at 100 p.p.m. The effectiveness of either formulation in preventing the disease in Golden Queen peach seedlings was unimpaired and the foliage undamaged by mixture with flit 406 [captan], thirospray, colsul 40 plus Lawry's lime-sulphur, or Bordeaux mixture.

Gilmer (R. M.) & Brase (K. D.). **The comparative value of various indexing hosts in detecting stone fruit viruses.**—*Plant Dis. Reptr*, 40, 9, pp. 767–770, 1 fig., 1956.

At the New York State Agricultural Experiment Station, Geneva, six *Prunus* species were compared as indexing hosts for stone fruit viruses by budding with 126 individual isolates, each containing one or more viruses. In the greenhouse peach [22, p. 70] proved inferior and Nanking cherry and Shiro plum were of intermediate value. The most efficient were Albion plum, Montmorency sour cherry, and (in the field) three-year-old Shirofugen flowering cherry trees, but each of these still gave 10 to 15 per cent. false negative indexes.

National Pickling cucumber seedlings inoculated in the cotyledonary stage with leaf sap from budded peaches reacted positively with all the isolates, including three that had not produced symptoms on any of the *P.* species [cf. 35, p. 688].

Cameron (H. R.) & Moore (J. D.). **Prune dwarf virus and the sour Cherry viruses.**—Abs. in *Phytopathology*, 46, 11, p. 635, 1956.

As a result of indexing [at the University of Wisconsin] 85 sets of *Prunus* budwood from the United States and Canada, prune [plum] dwarf virus [36, p. 197 and next abstract] was detected in many and also, together with it or alone, a number of sour cherry viruses [cf. 35, p. 26], including those causing green ring mottle [? strain of cherry yellows virus: 33, p. 159; 35, p. 903], bark splitting of Montmorency cherry, reactions on Shiro-fugen and Kwanzan cherries [35, p. 465], and symptoms on cucumber [see next abstract]. The last-named were not found to be related to plum dwarf virus. In other lots of budwood containing plum dwarf virus with or without cherry [peach] necrotic ring spot [loc. cit.] and cherry yellows virus [35, p. 377] various combinations were found, but cherry yellows was never separate from peach necrotic ring spot. On the strength of these observations plum dwarf virus is considered to be a distinct virus from either of the two last-named.

Milbrath (J. A.). **Squash as a differential host for strains of stone fruit ringspot viruses.**—Abs. in *Phytopathology*, 46, 11, pp. 638–639, 1956.

The stone fruit virus isolated in cucumber [in Oregon: 35, p. 688 and preceding abstract] from hosts known to contain the viruses of [peach] ring spot, sour cherry yellows, prune [plum] dwarf [loc. cit.], and peach stunt [35, p. 286], either alone or combined, has been indexed on squash [cf. 33, p. 159], symptoms varying from local lesions, later necrotic, to bright gold leaf patterns, the latter especially on the variety Buttercup when the inoculum contained sour cherry yellows. A number of viruses were conveniently maintained in small dwarf plants of Mammoth White Bush Scallop squash. Hubbard squash developed distinctive lesions with certain strains. Virus cultures (25) from stone fruit were established by budding on to peach, transferred to cucumber and finally to squash.

Wilks (J. M.) & Welsh (M. F.). **Sweet Cherry foliage indicator hosts for the virus that causes little Cherry.**—*Canad. J. agric. Sci.*, 35, 6, pp. 595–600, 1 pl., 1955.

Investigations at Summerland, British Columbia, to find an indicator host for cherry little cherry virus [35, p. 200] disclosed that the leaves of the sweet cherry variety Star and the seedling S–6–6 (7), together with a number of other varieties and seedlings (which are tabulated) react to the virus with marginal or interveinal reddening, varying in intensity, accompanied in the latter variety by a chlorotic mottle and necrotic shot holes. These reactions are not produced by the latent cherry ring spot viruses [35, p. 903] that often accompany little cherry virus, nor by the viruses of western X little cherry [peach western X virus: see next abstract], mora disease [32, p. 199], rusty mottle [29, p. 313], or sour cherry yellows [34, p. 654].

Wilks (J. M.) & Milbrath (J. A.). **Comparative studies of the virus diseases western X little Cherry and little Cherry.**—*Phytopathology*, 46, 11, pp. 596–599, 1956.

In co-operative budding experiments at Oregon State College, Corvallis, and the Plant Pathology Laboratory, Summerland, British Columbia, the cherry little cherry virus of British Columbia and the western X little cherry virus [peach western X virus] of Oregon [cf. 36, p. 253] both caused malformation of the fruit and leaf reddening on a number of sweet cherry indicator varieties [see preceding abstract]. However, both sweet and sour cherry on [*Prunus*] *mahaleb* stock wilted and declined when inoculated with western X, whereas little cherry virus induced no leaf symptoms. Western X reddened the foliage of western chokecherry (*Prunus demissa*), but neither this host nor peach were affected by little cherry. Little cherry virus spreads much more rapidly than western X from tree to tree and within individual sweet cherry trees. On these grounds it is considered that two distinct diseases are involved, caused by two strains of the same virus.

Zeylstra (H. H.). **Papierchromatografie als middel voor de diagnose van de ringvlekkenziekte van Zoete Kers. Een voorlopige mededeling.** [Paper chromatography as a medium for the diagnosis of ring spot disease of sweet Cherry. A preliminary report.]—*Tijdschr. PlZiekt.*, 62, 6, pp. 325–326, 1 pl. [opposite p. 323], 1956. [English summary.]

At the Phytopathological Institute, Wageningen, the Netherlands, chromatographic distinction was obtained (using Whatman No. 1 filter paper with *n*-butanol-acetic acid-water as solvent) between sap from healthy cherry leaves and those infected with ring spot virus [cf. 34, p. 654; 35, p. 374], from trees on both clay and sandy soil, though these sometimes varied slightly. Practical application of this method requires further investigation.

Reeves (E. L.) & Cheney (P. W.). **A new form of the twisted-leaf virus disease of Cherries.**—Abs. in *Phytopathology*, 46, 11, p. 639, 1956.

A new form of cherry twisted leaf virus [35, p. 876], found on an old Lambert tree in Stevens County, Washington, produces a variety of symptoms on a number of cherry varieties (which are listed) that are unaffected, or only mildly affected, by the normal form. Only Black Tartarian of the 12 varieties inoculated carried the new form without symptoms, whereas the normal form may be latent in this and in Napoleon, Black Giant, Black Republican, Lambert, Spaulding, Ebony, and Lamida.

Milbrath (J. A.) & Williams (H. E.). **Bud abortion—a virus disease of Cherry.**—Abs. in *Phytopathology*, 46, 11, p. 639, 1956.

A Napoleon sweet cherry at The Dalles, Oregon, developed a virus disease which began with inward rolling of the leaves, an interveinal chlorotic mottle, and cessation of terminal growth. A shallow necrotic ring spot developed on green fruit. In the following year severe leaf- and flower-bud abortion occurred. Transferred to other Napoleon trees it produced similar symptoms but Bing developed severe cankers and gumming. Montmorency showed some die-back, reduced terminal growth, and leaf mottling and distortion. Peach was not affected by inoculation.

Deep (Ira W.). **Effectiveness of preplanting treatments with antibiotics in preventing crown gall on Mazzard Cherry.**—Abs. in *Phytopathology*, 46, 11, p. 635, 1956.

Of a number of preplanting treatments with antibiotics to protect Mazzard cherry [*Prunus avium*] against crown gall (*Agrobacterium tumefaciens*) [31, p. 69] 15 mins. in 400 p.p.m. terramycin, or one hour in 200 p.p.m. was the most effective,

following root pruning and dipping in a bacterial suspension, and was not phytotoxic. Infection was reduced in inoculated year-old trees to 49 and 41 per cent., respectively, from 99 in the untreated. In another trial, treatment in 400 p.p.m. agrimycin for one hour resulted in 5 per cent. incidence compared with 20 in an uninoculated [? untreated] control.

Williams (H. E.) & Cameron (H. R.). **Silver-leaf of Montmorency sour Cherry in Oregon.**—*Plant Dis. Reptr*, 40, 11, pp. 954–956, 2 figs., 1956.

Silver leaf (*Stereum purpureum*), though present in Oregon for some 40 years, had not been observed in commercial orchards nor reported as affecting Montmorency sour cherry trees until 1954, when 14 per cent. of a block of 448 trees showed symptoms. In the following year incidence seemed to be increasing, but by 1956 many trees had recovered, apparently as a result of the high summer temperatures [32, p. 134].

McKeen (W. E.). **Red stele of Loganberry.**—Abs. in *Phytopathology*, 46, p. 638, 1956.

The *Phytophthora* found associated with *Pythium* sp. in red stele of loganberries in Vancouver Island, Canada [33, p. 362], is considered to be a race of *P. fragariae* on the grounds of its morphology, cultural behaviour, resistance to it of British Sovereign strawberry, and the susceptibility of Huxley and Baron von Solemacher.

Vaughan (E. K.). **A strain of Pseudomonas syringae pathogenic on cultivated Blueberry.**—Abs. in *Phytopathology*, 46, 11, p. 640, 1956.

Cultural observations and reactions on different hosts showed that bacterial canker of cultivated blueberry [*Vaccinium*: 34, p. 531] was due to a distinct strain of *Pseudomonas syringae* [in Oregon]. Native species of *Vaccinium* and cherries were not susceptible to the pathogen, but *Syringa* spp. were.

Powelson (R. L.). **Red Raspberry root rot in northern Utah.**—Abs. in *Proc. Utah. Acad. Sci.*, 33, pp. 176–177, 1956.

Symptoms of decline on red raspberry plants [cf. 21, p. 296] in Utah include dwarfing of canes, bronzing and scorching of leaves, necrotic lesions on roots, and, in extreme cases, death of canes or entire stools. At Utah State Agricultural College *Cylindrocarpon* sp., *Coniothyrium* sp. *Fusarium oxysporum*, *F. solani*, *F. roseum*, *Pythium* sp., and *Tetracoccosporium* sp. were isolated from naturally infected roots, each fungus being subsequently re-isolated from necrotic root lesions following inoculation.

Cylindrocarpon sp., *F. oxysporum*, *F. solani*, and *P.* sp. appeared to be closely associated with the nematodes *Xiphinema americanum*, *Pratylenchus minyus*, *P.* sp., and *Boleodorus thylactus* in declined plants.

Miller (P. M.) & Stoddard (E. M.). **Hot-water treatment of fungi infecting Strawberry roots.**—*Phytopathology*, 46, 12, pp. 694–696, 1956.

In experiments at the Connecticut Agricultural Station, New Haven, to discover whether the hot water treatment applied to strawberry roots to kill nematodes (2 mins. at 127° F.) could be used against fungi, 2- and 14-day-old cultures of *Rhizoctonia* [*Corticium*] *solani*, *Fusarium* sp., and *Verticillium albo-atrum* [36, p. 38], all isolated from strawberry roots, were heated in a water bath over a range from 105° to 149° for 1, 4, and 7 mins. *Fusarium* was not killed and *V. albo-atrum* needed at least 4 mins. at 131°, but *C. solani*, even in mature cultures, was killed by 127° for 4 mins. Many strawberry varieties can withstand this if dug when dormant, stored for a fortnight or more, and planted immediately after treatment; even 2 mins. at 127° should reduce, if not eliminate, *C. solani*.

Miller (P. M.) & Stoddard (E. M.). **Field control of grey mold of Strawberries.**—*Plant Dis. Reptr*, 40, 9, pp. 788–789, 1956.

In field trials in Connecticut three applications each of captan 50-W (6 lb. per 100 gals.), thylate (3 lb.), and phygon XL ($\frac{3}{8}$ lb.), the first at the beginning of flowering and the last 13 days before picking, reduced infection of strawberry fruits by *Botrytis cinerea* to 65, 27, and 32 per cent., respectively, of that in the untreated plots [cf. 36, p. 254]. Thylate and phygon XL provided long residual protection.

Vaughan (E. K.). **Attempts to transfer Rubus and Fragaria viruses into herbaceous hosts.**—*Tijdschr. PlZiekt.*, 62, 6, pp. 271–273, 1956. [Dutch summary.]

Attempts at the Phytopathological Institute, Wageningen, the Netherlands, to transfer various viruses affecting raspberries and strawberries [32, p. 135; 35, p. 873] to herbaceous hosts of low tannin content were uniformly unsuccessful, despite the use of phosphate buffers, nicotine sulphate solutions, and various lyophilization techniques.

Simonds (N. W.). **A Banana collecting expedition to South East Asia and the Pacific.**—*Trop. Agriculture, Trin.*, 33, 4, pp. 251–271, 9 figs., 4 maps, 1956.

The author reports, *inter alia*, the occurrence of bunchy top virus in banana plantations in and about Cairns in North Queensland, a region from which the disease has hitherto been excluded by quarantine measures. Infection was also discovered in wild plants of *Musa banksii* at Waugh's Pocket, apparently the first record of natural as opposed to experimental infection in this host [cf. 34, p. 381], thus adding to the difficulties of control.

Erspamer (J. L.) & Zentmyer (G. A.). **Effect of vapam as a soil fungicide in control of Phytophthora root rot of Avocado trees.**—Abs. in *Phytopathology*, 46, 11, p. 636, 1956.

Experiments [in California] on the effectiveness of vapam [35, p. 31] to control *Phytophthora cinnamomi* root rot of avocado pear [cf. 35, p. 690] indicated 100 p.p.m., which reduced infection, to be the maximum concentration permissible without causing serious root damage. Effectiveness of vapam varied with the factors involved in site, method, and conditions of application. Correct rate of application is important, and watering should follow.

Mezzetti (A.). **A new disorder of Oriental Persimmon in Italy.**—*F.A.O. Pl. Prot. Bull.*, 4, 12, pp. 181–183, 3 figs., 1956.

While the cause of the leaf fall of persimmon in Italy [29, p. 627] has not yet been definitely established, the symptoms displayed and the behaviour of the affected trees indicate that it may be caused by a virus present in a latent state in almost every *Diospyros kaki* var. *lycopersicum* tree grown in the country. Symptoms are manifested only under unfavourable growing conditions. The latent infection appears to protect trees from further infection by the same virus through grafting.

Brittain (R. W.) & Carleton (W. M.). **How surfaces affect pesticidal dust deposition.**—*Agric. Engng, St. Joseph, Mich.*, 38, 1, pp. 22–25, 31, 6 figs., 1 diag., 2 graphs, 1957.

At the Michigan Agricultural Experiment Station, Lansing, the manner in which the nature of plant surfaces affects the deposition of fungicidal dusts [cf. 32, p. 138; 35, p. 206] was studied by depositing dusts on representative surfaces under controlled conditions. Air velocity, dust-particle size, and leaf angle were varied to determine their interaction with surface effects. Tomato, bean [? *Phaseolus vulgaris*], and lettuce leaves were used in one experiment and non-plant surfaces in another.

Results indicated that bean and tomato leaves were more favourable for dust deposition than lettuce leaves. When both surfaces were directly exposed there was a significantly higher deposit, possibly due to protruding veins, on the lower. A larger percentage of fine dust was deposited on metallic surfaces and a larger percentage of coarse dust on soft wax and petroleum jelly. The deposit of finer dust increased, and that of coarser dust decreased, with increased air speed, and more dust was deposited when the leaf was parallel, rather than perpendicular, to the air-stream.

Bowman (Frances W.) & Wingenbach (J. J.). **A method for minimizing the fungistatic activity of sodium caprylate in sterility testing.**—*Antibiot. & Chemother.*, 7, 1, pp. 5–8, 1957.

The sterility test at present employed at the Food and Drug Administration, Department of Health, etc., Washington, D.C., for the recovery of moulds from toothpaste and similar products containing sodium caprylate was found to be inadequate. However, by changing the pH in the official method from 5·7 to 7·4, contaminating *Penicillium* spores can be recovered almost completely, provided the sodium caprylate content of the sample does not exceed 100 mg.

Campbell (L.). **Control of plant diseases by soil-surface treatment.**—Abs. in *Phytopathology*, 46, 11, p. 635, 1956.

At the Western Washington Experiment Station soil-surface treatment showed promise as a means of disease control. A pre-emergence spray of dinitro amine controlled mint rust [*Puccinia menthae*: 35, p. 633]; PCNB after seeding reduced black root (*Corticium* [*solani*: 34, p. 565]) of cauliflower by 97 per cent.; dichlone and PCNB soon after emergence reduced *Sclerotinia* [*sclerotiorum*] stem rot of beans [*Phaseolus vulgaris*: 34, p. 425] by 50 and 37 per cent., respectively; and a pre-harvest dust of captan reduced *Botrytis* [*cinerea*] fruit rot of strawberries [see above, p. 335] by 75 per cent.

Kundert (J.). **Über die Anwendung statistischer Methoden bei der biologischen Prüfung von Fungiziden.** [On the application of statistical methods in the biological assay of fungicides.]—*Annu. agric. Suisse*, (70), N.S., 5, 6, pp. 687–709, 2 diags., 1 graph, 1956. [French summary.]

Illustrating his arguments by a tabulated survey of the results of experiments in 1955 on the control of vine downy mildew (*Plasmopara viticola*), apple scab [*Venturia inaequalis*], and celery leaf spot (*Septoria apii*) in Switzerland, the author contends that the requisite conditions for the use of statistical methods are not adequately, if at all, realized in the biological assay of fungicides [cf. 29, p. 419 *et passim*]. The current tendency to exaggeration in the application of mathematical formulae is apt to lead to erroneous conclusions. It is concluded that equally reliable information can be obtained by a study of data on the properties, structure, nature, and composition of the test product. In the appraisal of a given compound, attendant phenomena and secondary effects, as well as fungicidal efficiency, should be taken into consideration.

Kleshchevich (N. F.). Заменитель Бордосской Жидкости. [A substitute for Bordeaux mixture.]—Сад и Огород [*Orchard & Garden*], *1956*, 6, pp. 29–30, 1956.

Powdered pyrites slag [mostly iron sulphide] as a substitute for Bordeaux mixture proved successful in the Ukraine, U.S.S.R., from 1951 to 1955, inclusive, for the control of [unspecified] bacteriosis of cucumber, a complex of tomato diseases, and *Phytophthora* [? *infestans*: 35, p. 921] and early spotting [? early blight: *Alternaria solani*] of potato. In 1955 one application (22nd June) (150 kg.

per ha.) increased the yield of cucumbers (variety Vyaznikovsky) from 153 c[entner] per ha. (untreated) to 278 c., two applications (22nd June and 28th August) gave 319 c.; for three applications (22nd June and 12th and 28th August) of 1 per cent. Bordeaux mixture it was 266 c. Similarly, one application of pyrites slag (2 c. per ha.) increased the yield of Bison tomatoes by 34 per cent. and that of Agronomichesky potatoes by 29 per cent.

Pyrites slag is 10 to 15 times cheaper than Bordeaux, is non-toxic, and can be applied either by hand or by special dusting machines. It is particularly suitable for soil applications on potatoes growing in peat soils. It can also be used on a wide range of crops, especially orchard trees. Experiments on dusting cherry trees against scald (*Monilia*) [*Sclerotinia* spp.: 2, p. 172; 17, p. 441] and pear and apple trees against scab [*Venturia pirina*: loc. cit.; and *V. inaequalis*: 35, p. 907] have given satisfactory results.

Hudson (J. P.). **Control of plant environment for experimental work and notes on environmental control equipment in use in Britain.**—*Misc. Publ. Dep. Hort. Univ. Nottingham* 8, 31 pp., 1957.

This useful publication gives a summarized account of the equipment available for the experimental control of plant environment. The introductory pages note the factors to be controlled and the need for flexibility in control. General notes follow on types of controlled environments, including growth cabinets, temperature controlled rooms, growth rooms, and glasshouses, and the methods of controlling conditions within them. In conclusion the various types of apparatus of this nature now in Britain are listed, with the institutions where they are located, the full addresses being given in an appendix. There is also a list of 58 references.

McKay (R.). **Some plant disease problems of agricultural advisers.**—*J. Dep. Agric. Eire*, 52, pp. 15–19, 1955–56.

In this address, given to instructors in agriculture of the Republic of Ireland in 1954, the author discusses a number of plant pathological problems. Dealing with virus diseases of potatoes, he states that at Albert College it was demonstrated that infection by the latent strain of potato virus X [17, p. 339] has no effect whatever on the yield of Up-to-Date. Glume blotch [*Septoria nodorum*: cf. 23, p. 11, *et passim*], together with mildew [*Erysiphe graminis*: 34, p. 441; 35, p. 209], was responsible for considerable damage to wheat, causing discoloration of the heads and non-development of the kernels; no control is practised.

McKay (R.). **Crucifer diseases in Ireland.**—78 pp., 31 pl., Dublin, At the Sign of the Three Candles, 1956. 21*s*.

The common diseases of crucifer crops in Ireland are described from macroscopic symptoms and illustrated by a large number of excellent photographs in this little book compiled for the use of agricultural and horticultural advisers. Sections are devoted to bacterial diseases, club root (*Plasmodiophora brassicae*), 13 selected fungus diseases, two virus diseases, and some miscellaneous disorders, including boron deficiency. Full directions for the control of each disease are given and short lists of relevant references appended to each chapter; there is a glossary of scientific terms.

Adams (D. F.), Shaw (C. G.), & Yerkes (W. D.). **Relationship of injury indexes and fumigation fluoride levels.**—*Phytopathology*, 46, 11, pp. 587–591, 2 figs., 1956.

In experiments at the State College of Washington, Pullman, Ethel Cave Cole and Snow Princess gladiolus plants [29, p. 466; 33, p. 548] and *Pinus ponderosa* seedlings were exposed to hydrogen fluoride fumigation [cf. 36, p. 48] at 0·7, 1·2,

and 12 parts per 1,000,000,000. A direct relationship was observed between the fumigation exposure factor (fumigation concentration × hours per day exposure) and the resultant foliar injury. Some of the pine seedlings, which were forced under glass in early May and were producing immature needles at the time of fumigation in June, proved far more susceptible than normal mature needles.

Only the exposed portions of the gladiolus leaves were subject to injury, and variation in the development of the youngest leaf accounted for some discrepancies in the results. Ethel Cave Cole proved slightly more sensitive than Snow Princess, but differences in sensitivity were noted between individuals of the same variety, and particularly between *P. ponderosa* pines from the same seed source.

Wright (Joyce M.). **The production of antibiotics in soil. III. Production of gliotoxin in Wheat straw buried in soil.**—*Ann. appl. Biol.*, 44, 3, pp. 461–466, 1956.

This is a more detailed account of the production of gliotoxin in pieces of straw buried in soil inoculated with a spore suspension of *Trichoderma viride* than that already noticed [35, p. 701]. Much less of the antibiotic was produced in straws buried in John Innes potting compost than in those in a Wareham Heath podsol. No antibiotic formed in straws from uninoculated soils, nor could antibiotic activity be detected in the straws when the pH of Wareham soil was raised by the addition to it of calcium hydroxide. The yield of gliotoxin was much higher in autoclaved straws than in those only soaked before burial, and the results suggest that this was due to a decrease in the pH of the straws on autoclaving rather than to a release of nutrients. The supposition that if antibiotics are produced in soil production will probably occur in localized areas where the food supply is favourable to the organisms concerned is supported by the evidence obtained in these studies. The pH of the organic substrate forming the food supply appears to be more important in antibiotic production in soil than the pH of the soil. It would appear that in some soils antibiotics may be produced which are antagonistic to pathogens depending for survival on their ability to overwinter on plant debris. In such cases, those pathogens most sensitive to antibiotics would be unable to colonize the available food substrates and would fail to survive.

Pridham (T. G.), Lindenfelser (L. A.), Shotwell (Odette L.), Stodola (F. H.), Benedict (R. G.), Foley (Colette), Jackson (R. W.), Zaumeyer (W. J.), Preston (W. H.), & Mitchell (J. W.). **Antibiotics against plant disease. I. Laboratory and greenhouse survey.**—*Phytopathology*, 46, 10, pp. 568–575, 1956.

The results are presented of an extensive survey of micro-organisms, chiefly strains of *Streptomyces*, for antibiotics to counter plant diseases [see next abstract], carried out by the United States Department of Agriculture at Peoria, Illinois, and Beltsville, Maryland. For the initial screening a wide range of bacterial and fungal pathogens was used. Strains were retained for further testing if they inhibited at least four of the six test bacteria and also if they were active against any of the seven pathogenic fungi. For the latter two methods were used, the 'cut-plug' technique, for which plugs were cut from the edge of the *S.* colony and placed on seeded plates of the fungus, and the 'spray-plate' technique [30, p. 622]; the former eliminated more isolates than the latter.

Secondary screening of the selected strains involved the selection of the most satisfactory liquid medium, and paper-disk assays of the filtrates. Of the test fungi, *Trichoderma viride* and *Mucor ramannianus* were the most useful for this type of test. *Corynebacterium fascians* proved the most sensitive test organism and *Agrobacterium tumefaciens* the most resistant of the Gram-negative species used, the slimy secretions of some of these possibly hindering access of the antibiotic to

the organism. The highest antibiotic activity in liquid media occurred with the addition of soybean or groundnut meal.

In greenhouse tests ten materials derived from the ten most active *S.* strains were tested against two or more of ten plant diseases. F-14 gave complete protection against *Phytophthora phaseoli* on Lima bean [*Phaseolus lunatus*]; F-17 (N.R.R.L. B-1699) against the same, *Erysiphe graminis* on Merion blue grass [*Poa pratensis*], and *Uromyces phaseoli* var. *typica* [*U. appendiculatus*] on Pinto bean [*Phaseolus vulgaris*]; and F-102 against the last. *Puccinia graminis* on wheat was markedly reduced by F-14 and F-17 and *E. polygoni* on bean by F-17.

Pridham (T. G.), Shotwell (Odette L.), Stodola (F. H.), Lindenfelser (L. A.), Benedict (R. G.), & Jackson (R. W.). **Antibiotics against plant disease. II. Effective agents produced by Streptomyces cinnamomeus forma azacoluta f. nov.**—*Phytopathology*, 46, 10, pp. 575–581, 1 fig., 1 diag., 1956.

At the United States Department of Agriculture, Peoria, Illinois, a strain of *Streptomyces cinnamomeus*, characterized by the whorled morphology and cinnamon-pink colour of the sporulating aerial mycelium and designated forma *azacoluta* f. nov. (N.R.R.L. B-1699) [see preceding abstract], has been found to give rise to a mixture of at least three antibiotics when grown in a medium of tap water, soybean meal, and glucose. A detailed description of the organism is given and its range of antibiotic activity tabulated. Greenhouse tests showed culture filtrates to be effective against four diseases of beans (*Phaseolus vulgaris*) [loc. cit.], including anthracnose (*Colletotrichum lindemuthianum*). Assays of numerous chemical fractions indicated that none of the three antibiotics shown by paper chromatography to be present is alone responsible for the activity against bean rust (*Uromyces phaseoli*) [*U. appendiculatus*], which was markedly inhibited. The dried filtrate retains its potency.

Heim (A. H.) & Lechevalier (H.). **Effects of iron, zinc, manganese and calcium on the growth of various strains of Streptomyces.**—*Mycologia*, 48, 5, pp. 628–636, 2 graphs, 1956.

In a study at Rutgers University, New Brunswick, New Jersey, of the effect of iron, zinc, manganese, and calcium on the growth of seven different species of *Streptomyces* [cf. 34, p. 673] cultured in a basic medium in shake flasks, only iron gave a substantial increase in mycelial dry weight when the metals were present singly. Taking, however, the mean of all the experiments in which zinc and iron plus zinc were present it was found that they were markedly beneficial. The rate of growth and of lysis of *S. fradiae* 3535 varied with the composition of the medium; calcium delayed lysis. The final levels of growth attained varied widely, indicating significant differences between the cultures used in quantitative or qualitative mineral requirements or both.

Ark (P. A.) & Wilson (E. M.). **Movement of streptomycin into plant tissues from streptomycin-pyrophyllite formulations.**—Abs. in *Phytopathology*, 46, 11, p. 634, 1956.

The sap of primary leaves of bean plants [? *Phaseolus vulgaris*] dusted with streptomycin-pyrophyllate formulations containing 500 and 1,000 p.p.m. streptomycin [at the University of California, Berkeley: cf. 35, p. 615] contained, respectively, 6 and 5·5 p.p.m. streptomycin after three days. Trifoliate leaves contained 5·5 p.p.m. after one day and none four days later. Neither glycerol nor dipotassium phosphate improved penetration and together they prevented it.

In the sap of cucumber leaves one and six days after dusting with 1,000 p.p.m. streptomycin there was 7 p.p.m., but new leaves appearing four days after dusting had none.

Yarwood (C. E.). **Cross protection with two rust fungi.**—*Phytopathology*, 46, 10, pp. 540–544, 1 fig., 1 graph, 1956.

After a detailed description of three methods employed to obtain known concentrations of spores and to measure spore deposits per unit area the writer describes investigations at the University of California, Berkeley, which demonstrated the cross protection afforded by certain quantities of uredospores of *Uromyces phaseoli* [*U. appendiculatus*: 36, p. 159] on sunflower leaves and *Puccinia helianthi* on Pinto bean (*Phaseolus vulgaris*) against infection by either fungus on its own host [cf. 33, p. 573]. The ED_{50} value for *U. phaseoli* against infection by *Puccinia helianthi* averaged 1·3 mg. spores per sq. dcm., compared with 0·4 mg. for Bordeaux mixture and 0·02 mg. for zineb; for *P. helianthi* against *U. phaseoli* it was 4 mg. uredospores compared with 0·3 and 0·02 mg. of the same fungicides, respectively. Results were also expressed as fungicide coefficients, i.e., the ratio of the ED_{50} values of the fungicides to the comparable ED_{50} of spores or the inhibitor produced by them; the Bordeaux mixture and zineb coefficients for *U. phaseoli* against *P. helianthi* were 0·3 and 0·015, respectively. Assuming that 3 per cent. of the dry weight of the spores is inhibitor, the Bordeaux and zineb coefficients of this are then about 10 and 0·5, respectively.

Inoculation with high concentrations of uredospores of either fungus on its own host did not (for reasons as yet unknown) yield the self protection that might have been expected [36, p. 159]. Some protection occurred when beans or antirrhinum were inoculated first with a strain of their rust from which they were immune and later with one to which they were highly susceptible [cf. 16, p. 387]. With beans an average of 33 per cent. protection was obtained; with antirrhinum it was less. Reinoculation with *U. phaseoli* after cure of previous infection by heat [see above, p. 294] and pressure therapy [33, p. 4] resulted in heavy infection.

Schwinghamer (E. A.). **Effect of ionizing radiation on rust reaction in plants.**—*Science*, 125, 3236, pp. 23–24, 1 fig., 1957.

Studies at Brookhaven National Laboratory, Upton, New York, on the effects of chronic gamma-ray and acute X-ray treatments on the host-parasite interaction in flax rust (*Melampsora lini*, race 1), wheat stem rust (*Puccinia graminis tritici* [*P. graminis*], races 15B and 111), oat stem rust (*P.g. avenae* [*P. graminis*], race 7A), and crown rust of oats (*P. coronata avenae* [*P. coronata*], race 202) are described. For chronic gamma treatments (from 9·4 c Co^{60}), seedlings grown to the first- or second-leaf stage were used, time of inoculation being one of the chief variables. With X-rays inoculations were made immediately after treatment.

Gamma radiation did not noticeably affect the rust reaction of 16 resistant flax varieties inoculated before or after application of a 10-kr chronic dose. A 10-kr acute dose was lethal to over 90 per cent. of one-day-old infections. Radiation before inoculation produced no appreciable change in the infection type of wheat or oat plants in some resistant varieties, while plants of other varieties became less resistant in varying degrees. No increase in resistance was noted, the trend being always towards susceptibility.

Chronic irradiation begun one day after inoculation was less effective in reducing resistance. In the acute X-ray treatment breakdown of rust resistance would, apparently, reach a maximum with approximately 3-kr. In wheat varieties normally resistant to races 15B and 111 (weakly pathogenic), the shift towards susceptibility in irradiated plants was much greater with 15B than with 111.

Partial-plant irradiation demonstrated that the crown (especially the shoot apex) is the most radio-sensitive site. Irradiation here induced some of the physiological modification that favoured rust development on the leaves. Leaf treatments alone produced no injury or significant reduction of resistance.

Schein (R. D.), Blumberg (W. E.), & Kooiman (R. R.). **A thermistor-equipped psychrometer for plant research.**—*Plant Dis. Reptr*, 40, 11, pp. 929–933, 6 figs., 1 diag., 1 graph, 1956.

From Pennsylvania State University, the University of California, Berkeley, and Fort Detrick, Maryland, the authors describe a portable, accurate, thermistor-equipped psychrometer suitable for studying the influence of temperature and humidity on the development of plant pathogens in the field [cf. 34, p. 800]. The advantages of the instrument are that it has an independent power source and low-volume air sampling, causes negligible disturbance of air in the sampling area, and can operate continuously for several hours. The wet and dry elements contain Western Electric bead thermistors (14-B) and project into the air stream.

Waid (J. S.). **Root dissection: a method of studying the distribution of active mycelia within root tissue.**—*Nature, Lond.*, 178, 4548, pp. 1477–1478, 1956.

At the Grassland Research Institute, Hurley, Berkshire, the technique devised for the study of active fungus mycelia on root surfaces [35, p. 34] was modified and applied in an investigation of the saprophytic micro-fungi in decomposing roots of rye grass (*Lolium perenne*). Washed roots were cut into 2 mm. fragments and the outer cortex removed under sterile conditions; the inner stele, outer cortex, and whole roots were then plated in three series on Czapek-Dox agar and incubated for three weeks at 25° C. By this means the spatial relationships of the fungi in the tissues could be elucidated. Mycelia which were rarely obtained from intact roots because of competition with more active fungi were secured frequently from the separated outer cortex. In this way it was shown that *Fusarium culmorum* could invade the inner cortex of rye grass when established in the outer cortex.

In an attempt to isolate the mycorrhizal fungi associated with beech roots several non-sporing fungi were obtained from the cortex, while those from the hyphal mantle were mainly sporing forms.

Last (F. T.) & Hamley (Rosemary E.). **A local-lesion technique for measuring the infectivity of conidia of Botrytis fabae Sardiña.**—*Ann. appl. Biol.*, 44, 3, pp. 410–418, 4 graphs, 1956.

In investigations at Rothamsted Experimental Station conidial suspensions of *Botrytis fabae* applied to leaves of broad bean plants produced lesions (more from young cultures than from old) directly proportional in number to the concentration of the inoculum [35, p. 872]. Variation in lesion numbers between plants within a pot greatly exceeded that between the opposite half-leaflets, as did variation between pots and between leaves of old (but not of young) plants.

As the standard error of the number of lesions (x) developing per half-leaflet increases with increasing mean the values of x require to be transformed; a convenient transformation is $z = \log_{10} \frac{1}{2} \{x+c+\sqrt{(x^2+2\ cx)}\}$, where $c = 20$.

Bourel (J.). **La protection des articles cellulosiques contre les moisissures.** [The protection of cellulose articles against moulds.]—*Industr. text., 1956*, 387, pp. 599–604, 1956.

This is a review of some important recent contributions to the literature on the general principles governing the protection of cotton and other cellulose fibres against moulds, and on current trends in the application of preservatives.

Cooke (W. B.), Moore (W. A.), & Kabler (P. W.). **B.O.D. satisfaction of fungi.**—*Sewage Industr. Wastes*, 28, 9, pp. 1075–1086, 5 graphs, 1956.

In experiments at the Robert A. Taft Engineering Center, Cincinnati, Ohio, the B.O.D. (biochemical oxygen demand) determination was used to evaluate oxygen-depleting capacities of *Fusarium aquaeductum*, *F. oxysporum*, *Geotrichum can-*

didum, *Margarinomyces heteromorphum*, *Penicillium lilacinum*, *P. melinii*, *P. ochrochloron*, and *Trichoderma viride*. They equalled or exceeded those of *B*[*acillus*] *aerogenes* and other bacteria (*Industr. Engng Chem.*, 23, p. 213, 1931) in pure culture on a synthetic medium containing 150 p.p.m. each of glucose and glutamic acid in 'Formula C' dilution water at pH 7·2. Activity increased as the medium became more acid and declined with increasing alkalinity. Used in mixed culture with 24- or 48-hour settled sewage [34, pp. 49, 739] the fungi gave lower B.O.D. values than the sewage alone, except at pH 9·5, when they were higher. Used by itself, on the other hand, mould inoculum usually had a lower B.O.D. than sewage alone or mixtures of the two.

The results of the tests indicated that with moulds alone significant reductions in dissolved oxygen may be achieved during the first four days of incubation at pH 2·9, as compared with pH 5·1 or 7·2 required by sewage. This fact is attributable to the generally greater tolerance of low pH levels by the former. The fungi used are thus able to compete successfully with the other micro-organisms in sewage for organic materials in solution and for dissolved available oxygen.

Hawker (Lilian E.). **The physiology of reproduction in fungi.**—128 pp., 1 fig., 3 graphs, Cambridge monographs in experimental biology 6, Cambridge University Press, 1956. 15*s*.

The available literature on the physiology of reproduction in fungi [36, p. 114] is surveyed from the standpoints of the growth of spores and spore-bearing structures, the physiology of vegetative reproduction, the effect of environment and nutrition on sporulation, the physiology of sex, and reproduction in the natural habitat. Suggestions for lines of future research are made [loc. cit.]. There is a comprehensive bibliography (pp. 107–123).

Gough (F. J.) & Lilly (V. G.). **Growth rates and vitamin requirements of forty-four fungi.**—*Proc. W. Va Acad. Sci.*, 27 (*1955*), (*Bull. W. Va Univ.*, Ser. 56, 12–5), pp. 19–24, 1956.

The exogenous vitamin requirements of 44 fungi, as determined by the rate and amount of growth in an essentially vitamin-free medium and in the presence of various vitamins, singly or in combination, are discussed [cf. 28, p. 478]. The following grew at essentially the same rate in a vitamin-free medium as in the same medium plus thiamine, biotin, inositol, and pyridoxine: *Acrostalagmus cinnabarinus* [*Nectria inventa*], *Alternaria solani*, *A. tomato*, *Ascochyta imperfecta*, *Botrytis cinerea*, *Cephalothecium roseum*, *Colletotrichum destructivum*, *C. graminicola*, *C. lagenarium*, *Curvularia trifolii*, *Mycosphaerella pomi*, *Sclerotium bataticola* [*Macrophomina phaseoli*], and *Trichoderma lignorum* [*T. viride*]. *Dendrophoma obscurans* (partially deficient for biotin and inositol), *Endoconidiophora* [*Ceratocystis*] *fimbriata*, *Endothia parasitica*, *Guignardia bidwellii*, *Poria obliqua*, and *Thielaviopsis basicola* were totally deficient for thiamine.

Partial thiamine deficiencies were exhibited by *Diplodia zeae*, *Endoconidiophora* [*C.*] *virescens*, and *Phoma betae* and partial biotin deficiencies by *Colletotrichum phomoides*. *Pseudoplea trifolii* was partially deficient for both thiamine and biotin.

Grewal (J. S.). **Effect of trace elements on growth and sporulation of Alternaria tenuis.**—*Lloydia*, 19, 3, pp. 188–191, 1956.

At the Department of Botany, University of Allahabad, India, the author examined the effect of trace elements on a strain of *Alternaria tenuis* from apple, using a trace element-free medium (Asthana and Hawker's medium A) [*Ann. Bot., Lond.*, 50, pp. 325–344, 1936], which by itself permitted growth without sporulation. Each of the elements promoted growth; zinc and iron were optimum at 0·25 mg. per l., and manganese, copper, and uranium at 0·0025. Zinc, copper, and uranium

did not induce sporulation at any of the concentrations provided, but calcium at 2·5 to 25, iron at 25, and manganese at 0·25 to 2·5 mg. per l. induced excellent, good, and fair sporulation, respectively.

Fothergill (P. G.) & Yeoman (M. M.). **Acidity and growth of Rhizopus stolonifer in mineral culture media.**—*Bull. Jard. bot. Brux.*, 26, 4, pp. 371–382, 2 graphs, 1956.

In studies at the Botany Department, King's College, Newcastle upon Tyne, on the nutritional requirements of *Rhizopus stolonifer* it became apparent that the acidity of the liquid medium is an important factor in obtaining large yields of mycelium. As growth continues the pH of the medium gradually drops to a minimum of about 2, the decrease being proportional to uptake of ammonia from the medium. After seven days' growth the sulphuric acid present in the medium in relatively large amounts causes most of the increase in acidity, though there are small amounts of lactic, malic, citric, and succinic acids. In the mycelium, on the other hand, organic acids occur in large amounts and sulphuric acid only in small ones. Fungal growth is proportional to buffer capacity. The greatest yield of mycelium was obtained in a medium containing 0·012 *M* potassium monohydrogen phosphate, 0·003 *M* magnesium sulphate, 0·025 *M* ammonium sulphate, 4 per cent. glucose, and iron, manganese, and zinc at 2 p.p.m., with sodium succinate buffer.

Sims (A. C.). **Factors affecting basidiospore development of Pellicularia filamentosa.**—*Phytopathology*, 46, 9, pp. 471–472, 1 fig., 1956.

At the Department of Botany and Plant Pathology, Ohio State University, Columbus, basidiospores developed on hyphae arising from mycelial mats of *Pellicularia filamentosa* [*Corticium solani*: 27, p. 304; 33, p. 722, and next abstract] formed on potato broth supplemented by 5 gm. per l. sucrose or maltose 10 days after transfer of the mats to *Alternanthera philoxerioides* stems and roots or when maintained at nearly 100 per cent. relative humidity. Basidiospores were also produced a month after mycelial fragments of isolates from basal semi-synthetic agar had been transferred to 2 per cent. agar and maintained at 20° C.; they were not formed at 15°, 25°, or 30°. Appressed hyphae of *C. solani* on the inside of plate lids held over sterile distilled water for 10 days gave rise to basidiospores. They developed also on cotton, *A. philoxerioides*, wandering Jew [*Tradescantia* sp.], potato, and sugar beet plants inoculated with mycelial suspensions (but not with pieces of mycelial mat) of various isolates of *C. solani* and maintained under bell jars at 20°. The addition of 5 or 20 gm. per l. sucrose to autoclaved potato and *A. philoxerioides* sap extracts also resulted in basidiospore formation.

Kerr (A.) & Flentje (N. T.). **Host infection of Pellicularia filamentosa controlled by chemical stimuli.**—*Nature, Lond.*, 179, 4552, pp. 204–205, 2 figs., 1957.

At the Waite Agricultural Research Institute, South Australia, the stimulation of *Pellicularia filamentosa* [*Corticium solani*: 36, p. 112 and preceding abstract] by exudates from radish seedlings was investigated. These were obtained from seedlings grown under sterile conditions in sand cultures and were concentrated by vacuum distillation. Small disks of filter paper were soaked with the resulting solution and placed on small islands cut in plates of distilled-water agar, the whole surface being covered with a disk of sterilized cellophane. Three of these plates were inoculated with different strains of *C. solani*; the only one which showed a marked response to the exudate was that which was pathogenic to radish. The response consisted of the prolific side-branching in the hyphae over the filter paper disks, similar to the branching produced in infection cushions on a radish stem, but no penetration of the cellophane occurred.

The radish strain of *C. solani* always penetrated the stem through the unwounded cuticle and epidermis, infection cushions being formed on the cuticle and not on exposed cortical cells when strips of epidermis were removed. Strips of radish stem epidermis were placed cuticle uppermost on strips of distilled-water agar to which 0·01 ml. root exudate had been added, and blocks of agar inoculated with the three strains of *C. solani* put adjacent to the strips. Infection cushions were formed only by the radish strain, which penetrated the strips as on living stems, but no penetration of control strips took place in the absence of the root exudate.

It is concluded that the attachment to, organization on, and penetration of a host by the radish strain of *C. solani* is governed by the nature of the cuticle surface and by a diffusible substance excreted on to the surface by the underlying cells.

Barnett (H. L.) & Lilly (V. G.). **Factors affecting the production of zygospores by Choanephora cucurbitarum.**—*Mycologia*, 48, 5, pp. 617–627, 5 figs., 1956.

In further studies at West Virginia Agricultural Experiment Station on the physiology of *Choanephora cucurbitarum* [34, p. 804] it was found that zygospores developed abundantly in a few days on a wide variety of agar and liquid media over a range of approximately 15° to 37° C., and in atmospheres containing up to 10 per cent. carbon dioxide when + and — cultures were paired. Light was unnecessary and had no apparent effect, except at 15° when it was inhibitory.

Zygospores were produced when the available carbon in the medium was exhausted by starvation. Certain sugars (sucrose, maltose (CP), lactose, and raffinose) favoured rapid production. All nitrogen sources tested were favourable in a medium not too acid, the favourable pH range being approximately 4·5 to 8·5. Constant pH was maintained by means of a horizontal culture tube designed to allow a continuous flow of liquid medium over the mycelium. The mycelia of the + and — strains were slightly yellow but in mixed cultures the mycelium was bright yellow, owing to the greatly increased amounts of β-carotene produced, apparently stimulated by hormone-like secretions from the opposite strain. Mature zygospores were also found in moist, decayed pumpkin flowers.

Van der Laan (P. A.). **Onderzoekingen over schimmels, die parasiteren op de cyste-inhoud van het Aardappelcystenaaltje (Heterodera rostochiensis Wollenw.).** [Investigations on fungi, parasites of the cyst contents of the Potato root eelworm (*Heterodera rostochiensis* Wollenw.).]—*Tijdschr. PlZiekt.*, 62, 6, pp. 305–321, 2 pl., 4 figs., 1956. [English summary.]

In studies at Wageningen, the Netherlands, on a hitherto neglected group of nematode-destroying fungi [cf. 35, p. 98] which kill larvae within the cysts, a number of species, including *Phialophora heteroderae*, *Phoma tuberosa*, *Colletotrichum atramentarium*, and *Monotospora daleae*, were repeatedly found in or on the cysts of the potato root eelworm (*Heterodera rostochiensis*) [35, p. 608].

Anixiopsis stercoraria and *Margarinomyces heteromorpha* [see above, p. 342] were found in cysts obtained from Peru, where the potato eelworm was found in 1952.

Cysts are easily invaded by fungi, and hyphae were found on the surface of most eggs, sometimes penetrating the shell, but not the larval cuticle. Dried out eggs containing shrivelled larvae, presumably resulting from external fungal infection, were observed. Culture filtrates of several fungi tested, however, showed no nematicidal activity. Parasitism of cysts obtained *in vitro* was not always repeated *in vivo* and vice versa. Pot experiments showed that fungi added to soil containing cysts lowered their vitality and numbers after six months and reduced the number of larvae in potato roots.

Watson (D. J.) & Wilson (J. H.). **An analysis of the effects of infection with leaf-roll virus on the growth and yield of Potato plants, and of its interactions with**

nutrient supply and shading.—*Ann. appl. Biol.*, 44, 3, pp. 390–409, 26 graphs, 1956.

These studies at Rothamsted Experimental Station were based on examination of the changes induced by potato leaf roll virus in the photosynthetic system of potato plants measured by leaf area and net assimilation rate [cf. 35, p. 479]. The results obtained demonstrated that the decrease in the total dry weight of Craigs Defiance potato plants caused by the virus was almost entirely at the expense of the tubers; the dry weight of the leaves and stems was increased and that of the roots and stolons only slightly decreased. The percentage loss of dry weight of the tubers was reduced by nitrogenous fertilizer but unaffected by phosphorus or potassium.

Infection considerably reduced the net assimilation rate (NAR) between May and early July, but later, infected plants had a higher NAR than healthy ones. Infection decreased leaf area per plant up to early July, but delayed leaf senescence, with the result that in late July and August infected plants had a greater leaf area than healthy ones. The mean reduction in NAR induced by the virus amounted to about 20 per cent.; this was the chief cause of loss in yield, the mean decrease in leaf area being only 4 per cent. The lower NAR of infected plants was due chiefly to the reduced photosynthetic efficiency of the older, rolled leaves.

Nitrogenous fertilizer increased leaf area throughout the growth period; phosphorus increased it in the early stages, but hastened leaf senescence, leaf area being reduced in August; potassium increased leaf area, particularly in the later stages of growth. When nitrogen, phosphorus, or potassium increased leaf area they generally also increased the effect of infection which reflected plant size. Except in the early stages of growth, affected plants had more leaves than healthy ones, because leaf production lasted longer and more lateral branches developed.

Shading decreased NAR, increased leaf area, had no effect on yield, and had no interactions with infection.

In Up-to-Date loss of yield from infection was less than in Craigs Defiance, because its leaf area was not decreased by the virus and NAR reduction began later.

The relative effect of infection on NAR was about five times that on leaf area. This is at variance with the results obtained by Bald and Hutton [29, p. 425], who concluded that the decrease of leaf area caused by leaf roll sufficed to account for the loss of tuber yield.

RAYMER (W. B.). **Identity and host relations of the Potato late-breaking virus.** —Abs. in *Phytopathology*, 46, 11, p. 639, 1956.

A virus causing late-breaking disease of potatoes in Oregon [34, p. 807] was identified as the western strain of aster yellows from its recovery in *Nicotiana rustica* by grafting and transmission by *Macrosteles fascifrons* to tomato, Jimson weed [*Datura stramonium*], and Ladino, red, alsike, and crimson clovers [loc. cit.]. On the basis of the symptoms developed on these hosts (which are described) the virus appears to be closely related to tomato big bud virus [35, p. 48], but is distinct in that *M. fascifrons* is not known to transmit the latter; also aster yellows virus failed to induce symptoms of big bud in tomato.

GRANCINI (P.). **Il mosaico giallo della Patata.** [Yellow mosaic of Potato.]—*Ann. Sper. agr.*, N.S., 10, 3, pp. 1101–1106, 2 figs., 1956. [English summary.]

Potatoes grown in both the plains and the mountain regions of Italy often display a yellow mosaic, generally attributed to potato aucuba mosaic virus. It is present in plants from both selected and non-selected tubers, and while there is usually no difference in infection between plants of different origin grown in the same field,

there is when tubers from the same source are planted in different fields. The symptoms appeared to the author to resemble those of calico in the United States caused by lucerne mosaic virus [cf. 19, p. 563; 35, p. 483]. Inoculation experiments at the High Altitude Experimental Station, Teodone, Brunico, demonstrated the presence of this virus in affected potato plants.

NIEDERHAUSER (S.). **The blight, the blighter, and the blighted.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 19, 1, pp. 55–63, 4 figs., 1956.

Essential information is presented on the history of potato blight (*Phytophthora infestans*), studies on physiological specialization within the fungus in Mexico [35, p. 921], and the work in progress on the development of resistance to the disease in Mexico, believed to be the native home of the pathogen (*Amer. Potato J.*, 20, pp. 118–126, 1943).

TOXOPEUS (H. J.). **Reflections on the origin of new physiologic races in Phytophthora infestans and the breeding for resistance in Potatoes.**—*Euphytica*, 5, 3, pp. 221–237, 1 fig., 1956. [Dutch summary.]

Following a detailed discussion [cf. 32, p. 314] of the present knowledge of breeding for resistance to *Phytophthora infestans* in the potato [36, p. 269] under the headings hypersensitivity versus field resistance, the origin of new races, biology and adaptation, adaptation to varieties containing R-genes, and to those with a high degree of field resistance, the author suggests that attempts should be made to determine whether the correlation (which is probably mainly of a physiological nature) of late maturity with field resistance can be broken. Wild and cultivated tuber-bearing species from the Andes and *Solanum demissum* should be searched for resistance genes which are not linked with late maturity. The R-genes from *S. demissum* [cf. 34, p. 102] are of value in that although races may arise capable of overcoming the resistance conferred, they produce epidemics only after the common race has built up infection to epidemic proportions on other varieties. For this reason R-genes are more promising for first and second early varieties than for late ones, and because field resistance probably cannot be introduced into the former. With later maturing varieties, however, field resistance is of great importance. Its combination with R-genes may prove very useful. The presence of even a small acreage of a susceptible variety may prevent the adaptation of the parasite to more resistant varieties. Susceptible varieties should, therefore, not be eliminated, but should rather be planted on a small scale in plots scattered strategically over the whole area occupied by the resistant varieties.

It is considered that the study of tuber resistance is of prime importance. In the early R varieties it is of special value, for once an appropriate *p*-race of the parasite (i.e., one having a *p*-gene for ability to attack an R plant) is established the variety is heavily damaged by reason of its low field resistance.

For the time being breeding should be concentrated on combining two R-genes, one of which should be R_3; R_4 seems to be of little importance at present.

THIEDE (H.). **Ergebnisse der Bekämpfung von Phytophthora infestans de By. in den Jahren 1950–1955.** [Results of the control of *Phytophthora infestans* de Bary in the years 1950 to 1955.]—*Höfchen-Briefe*, 9, pp. 164–172, 1956. [Abs. in *Z. PflKrankh.*, 64, 2, p. 110, 1957.]

An evaluation of 754 spraying experiments performed in Westphalia from 1950 to 1955 for the control of potato blight (*Phytophthora infestans*) [36, p. 268] suggested that an increased yield estimated at 21 per cent. resulted. The potential net gain for the province was computed at DM. 23,756,000, which should be multiplied tenfold for Federal Germany as a whole. The best results were obtained by the following rates of application: 45 to 50 per cent. copper oxychloride or 35 per

cent. copper oxide at 4 to 5 kg. per ha.; or zineb at 1·5 to 1·8 kg. Captan failed to confer adequate protection.

Raucourt (M.) & Ventura (E.). **Étude de l'efficacité de produits fongicides sur le mildiou de la Pomme de terre.** [Study of the efficacy of fungicidal substances on Potato blight.]—*Phytiatrie-Phytopharm.*, 5, 3, pp. 163–171, 1956.

In tests carried out at Attigny, Ardennes, France, the efficacy of ten different fungicides against potato blight [*Phytophthora infestans*: cf. preceding abstract] on the variety Bintje was assessed by giving one application of the fungicide, either on the day when the first symptoms appeared (series A) or eight days later (series B), and noting the percentage of foliage destroyed at intervals until destruction was complete (in 30 days). The difference between the time taken for 50 per cent. destruction in series A and in untreated plants was taken as a measure of the protection afforded [cf. 34, p. 808]. On this basis, the compounds were arranged in order of decreasing efficacy as follows, series B being not greatly different from A: 2 per cent. then 1 per cent. Bordeaux mixture, ziram copper (250 gm. copper, as copper oxychloride, plus 117 gm. ziram per hl.), 0·6 per cent. Bordeaux mixture, a product containing 150 gm. zineb per hl., copper octoate (160 gm. copper), a product containing 250 gm. maneb, zineb copper (32·5 copper plus 119 gm. zineb), copper octoate (80 gm. copper), and a product containing 250 gm. ziram.

In a second test, where the A and B treatments were combined, 2 per cent. Bordeaux and copper oxide in oil were far superior to lead arsenate and silver salicylate.

The yield of the Bordeaux-treated plots was 18 per cent. higher than the untreated.

Hooker (W. J.). **Survival of Streptomyces scabies in peat soil planted with various crops.**—*Phytopathology*, 46, 12, pp. 677–681, 1 fig., 2 graphs, 1956.

This is an expanded account of investigations in Iowa on the survival of *Streptomyces* [*Actinomyces*] *scabies* in soils planted with potatoes and other crops, an abstract of which has already been noticed [35, p. 391].

Menzies (J. D.). **Dosage rates and application methods with pentachloronitrobenzene for control of Rhizoctonia and scab in Potatoes.**—Abs. in *Phytopathology*, 46, 11, p. 638, 1956.

In the Yakima Valley, [Washington], application of 20 lb. per acre (10 p.p.m.) PCNB [36, p. 266] to heavily infested fine sandy loam controlled stem canker (*Rhizoctonia* [*Corticium*] *solani*) [cf. 33, p. 556] of potatoes, and at 40 lb. controlled tuber sclerotia of *C. solani* and scab (*Streptomyces* [*Actinomyces*] *scabies*) [loc. cit.; 34, p. 395]. Lower rates may be used if concentrated near the plant. Incorporation was equally effective by disking or roto-tilling before planting, but was ineffective by harrowing after planting.

McLean (J. G.), Letorneau (D.), & Guthrie (J. W.). **Verticillium wilt resistance of Potatoes correlated with histochemical tests for phenols.**—Abs. in *Phytopathology*, 46, 11, p. 638, 1956.

Using the ferric chloride test for detecting resistance to potato scab [*Actinomyces scabies*: 35, p. 881] the authors found that certain susceptible types [at Idaho Experiment Station, Aberdeen] gave the reaction in the periderm and cortex of the tubers. A highly significant correlation was found between this reaction and field resistance to *Verticillium* [*albo-atrum*: 36, p. 270]. Using ferric chloride and methyl red in the field it was found that decrease in intensity of colour development was correlated with disease development in the field, susceptible varieties showing less and more rapidly declining colour than resistant ones.

Young (R. A.). **Control of early maturity disease of Potatoes by soil treatment with vapam.**—*Plant Dis. Reptr*, 40, 9, pp. 781–784, 1 fig., 1956.

At Klamath Falls, Oregon, the early maturity disease of potato attributed principally to *Verticillium albo-atrum* [27, p. 119 and preceding abstract] was effectively controlled by injection of 190 lb. vapam [36, p. 52] per acre at a depth of approximately 6 in. into the soil with a blade applicator ten days before planting. Plants in the treated soil remained green long after those in the untreated soil had become yellow and dry.

Mooi (J. C.). **Knolaantasting bij enkele Aardappelrassen door Colletotrichum atramentarium.** [Tuber infection of some Potato varieties by *Colletotrichum atramentarium*.] -*Tijdschr. PlZiekt.*, 62, 6, pp. 274–284, 9 figs., 3 graphs, 1956. [English summary.]

Most of the information contained in this paper on a disease of Saskia and other potato tubers in the Netherlands, resulting in superficial patches of necrotic tissue and associated with *Colletotrichum atramentarium* [36, p. 267], has already been noticed [34, p. 480]. The author considers *C. atramentarium* to have been fully established by his investigations as the causal organism of the disease, which he believes to be similar to if not identical with that in Austria attributed by Wenzl to low temperature [36, p. 208], and to a disease in Germany recently described by Braun (*Kartoffelbau*, 6, pp. 263–265, 1955).

Malcolmson (Jean F.) & Bonde (R.). **Studies in the control of bacterial and fungous decay of Potato seed pieces.**—*Plant Dis. Reptr*, 40, 8, pp. 708–713, 2 figs., 1956.

At Maine Agricultural Experiment Station fungicides were tested for compatibility with streptomycin sulphate, previously found to give good control of bacterial decay of potato seed pieces [35, p. 323] though increasing rotting due to fungi. Neither dithane nor dow M-137 affected the activity of streptomycin sulphate and agrimycin 100 against *Erwinia atroseptica* and *Pseudomonas fluorescens* on inoculated seed pieces. Good control of fungus decay was obtained by treating the tubers with dithane (2 qts. in 100 gals.), phygon (2 lb.), or captan (2 lb.) before cutting, the seed pieces then being dipped in 100 p.p.m. agrimycin 100.

None of the antibiotics tested proved effective against both bacteria and fungi, but rimocidin sulphate at 100 and 200 p.p.m., alone and in combination with agrimycin 100 (200 p.p.m.), was effective against *Fusarium sambucinum* f. 6 [*Gibberella cyanogena*] and *Phoma tuberosa* on inoculated seed pieces.

Kurata (H.), Ogasawara (K.), & Frampton (V. L.). **Microflora of milled Rice.**—*Cereal Chem.*, 34, 1, pp. 47–55, 1 map, 1957.

Compared with the findings reported in a recent study [32, p. 507], 66 samples of milled rice produced commercially in the southern area of the United States in 1954 were virtually free (99·1 per cent.) from internal infection by fungi, while bacteria, yeasts, and actinomycetes were altogether absent.

Johnston (A.). **Diseases of Rice in Malaya.**—*News Lett. int. Rice Comm.* 15, pp. 14–18, 1955.

The writer gives brief notes on the commoner diseases of rice in Malaya [30, p. 509; 32, p. 119; 34, p. 251] and appends a list of all the fungi so far recorded there on this crop. False smut (*Ustilaginoidea virens*) and 'penyakit merah' [35, p. 712] are included.

Bernaux (P.). **La piriculariose du Riz en France.** [Rice blast in France.]—Reprinted from *Riz et Rizic.* [N.S.], 2, 2, 5 pp., 4 figs., 1956.

A brief, popular account, based on the literature and on several years' observa-

tions in La Camargue, France, is given of rice blast (*Piricularia oryzae*) [30, p. 55] under the headings: symptoms and damage caused, life-cycle of the pathogen, conditions affecting the development of the parasite, varietal susceptibility, and control.

Cooke (W. B.). **Fungi, lichens and mosses in relation to vascular plant communities in eastern Washington and adjacent Idaho.**—*Ecol. Monogr.*, 25, pp. 119–180, 6 graphs, 1 map, 1955. [Received 1957.]

The fungi, bryophytes, and mosses in 18 plots in six varied plant associations in eastern Washington and western Idaho were collected over three spring, one summer, and four autumn seasons (1946–1949), and their distribution and frequency studied in relation to soil and climatic conditions and plant cover. The results are presented in tables covering 48 pages. Altogether 815 species of (mostly macro) fungi are listed, a large number being cosmopolitan. They tended to be more constant in the moister areas. Autumn sporophore production and size was correlated with precipitation and spring production with temperature, the former increasing relatively from the drier to the moister habitats.

Limited microbiological tests suggested that more fungus colonies were obtained from forest than from grassland [cf. 34, p. 673]. Cloth burial tests indicated more cellulosic activity in prairie than in forest soil. *Thielavia sepedonium* [27, p. 487; 29, p. 473] and *Microsporum gypseum* [32, p. 38] sporulated abundantly on buried unbleached cotton duck and undyed wool charmeen, causing complete degradation of the latter. They were not secured in plate isolations.

Sorteberg (A.). **Magnesium et nødvendig plantenæringsstoff.** [Magnesium an essential plant nutrient.]—*Norsk Landbr.*, *1957*, 2, pp. 27–29, 2 figs., 1957.

Magnesium deficiency is stated to affect a number of crops in Norway [36, p. 124] besides fruit (especially apple) trees [31, p. 559]. They include cereals, potato, beet, and kohlrabi. A shortage in clover and timothy [*Phleum pratense*] may contribute to the occurrence of cramp in livestock fed on the hay. Experiments have been organized by the Institute for Soil Culture of the State Agricultural College to determine the practicability of control by soil amendments with magnesium sulphate and other basic magnesium compounds.

Eglitis (M.), Johnson (F.), & Breakey (E. P.). **Soil pasteurization with high frequency energy.**—Abs. in *Phytopathology*, 46, 11, pp. 635–636, 1956.

Soil samples highly contaminated with *Pythium* sp. were exposed in two types of generator to high frequency energy (27 megacycles), 5 minutes' exposure generally sufficing to control damping off of crimson clover. Seed of 90 per cent. germination capacity gave 85·5 per cent. germination with no damping-off in the treated soil and 24·4 in the untreated. In another soil type a seedling stand of 84·7 per cent. was obtained, compared with 9·1 in the control.

Cook (A. A.). **Varietal response of Castorbean to Tobacco ring spot virus.**—*Plant Dis. Reptr*, 40, 7, pp. 606–610, 3 figs., 2 graphs, 1956.

In experiments conducted by the Field Crops Research Branch, Agricultural Research Service, and the Agronomy Department, Agricultural Experiment Station, Gainesville, Florida, of the ten viruses sap inoculated on castor bean (*Ricinus communis*), only tobacco ring spot was pathogenic [cf. 19, p. 229]. There were three distinct types of reaction. In varieties such as Cimarron leaf symptoms were accompanied by only slight necrosis of the epicotyl in a few plants and recovery was general; in the group represented by U.S. 49 there was extensive internal necrosis of the hypocotyl followed by death of the plants; in other varieties, such as Conner, reaction was intermediate, characterized by early killing of the growing point.

Calpouzos (L.). **Identification of two fungi attacking fruit of Strophanthus intermedius in Puerto Rico.**—*F.A.O. Pl. Prot. Bull.*, 4, 12, pp. 179–180, 1 fig., 1956.

Strophanthus intermedius in Puerto Rico is affected by a fruit blight, the young fruits being dry, wrinkled, and blackened, and many of them falling prematurely. The young flowering stems frequently bear black, necrotic lesions. Isolations from young diseased fruits yielded *Diplodia* [*Botryodiplodia*] *theobromae*, while those from old ones gave both *B. theobromae* and *Colletotrichum gloeosporioides* [*Glomerella cingulata*]. If *S. intermedius*, possibly of medicinal value, should be cultivated commercially in tropical areas in which these two pathogens are present, severe fruit losses are to be anticipated.

Loveless (A. R.) & Smith (C. E. M.). **Seedling blight of Sugar-Cane—a new disease caused by Helminthosporium sacchari Butler.**—*Ann. appl. Biol.*, 44, 3, pp. 419–424, 1956.

Studies at the University College of the West Indies, Jamaica, and the Research Department, Sugar Manufacturers' Association of Jamaica, demonstrated that seed-borne transmission of *Helminthosporium sacchari* [see next abstract] occurs and is responsible, especially in very humid conditions, for the death of germinating seedlings. One or more reddish-brown spots not more than 1 mm. in diameter appear on the coleoptile three to six days after sowing, and after 12 to 14 days the leaves become chlorotic and the seedling dies.

Of 100 seedlings from 'fuzz' artificially contaminated with spores of *H. sacchari*, the 21 that germinated were all killed by the pathogen. Prolonging the exposure of seedlings to humid conditions (by glass sheets over the boxes) for from five to 12 days increased the percentage mortality, due mainly to seedling blight, from 0 and 14 in two sets of seedlings to 54 and 75 per cent., respectively. The increased germination induced by the glass sheets more than makes up for the risk of infection, but they should be raised progressively after three to four days. It was also established that older, surviving seedlings are again rendered susceptible by accidental wounding during transplanting.

The authors suggest that 'eye spot' of sugar-cane should be altered to 'eye spot and seedling blight'. The usual practice of sowing fuzz on the soil surface eliminates any pre-emergence period of susceptibility and under favourable conditions all except severely infected seedlings usually survive, but in breeding plots the disease may be responsible for a loss of potentially desirable seedlings.

Annual Report of the Research Department of the Sugar Manufacturers' Association of Jamaica for 1954.—89 pp., 21 graphs, [1955].

In the section of this report (pp. 25–26) dealing with diseases of sugar-cane in Jamaica during the period under review it is noted that eye spot (*Helminthosporium sacchari*) [see preceding abstract and 35, p. 845] was conspicuous on the varieties Co. 331, Co. 421, B 34104, and B 37172 and was also recorded on B 41227 and B 42231. There was no repetition of the red rot [*Glomerella tucumanensis*: loc. cit.] outbreak on B 4362, nor was pokkah boeng [*Gibberella fujikuroi*: loc. cit.] serious.

The incidence of chlorotic streak virus [loc. cit.] on B 4362 is on the increase and in a field experiment on the effect of the disease on yield the growth of diseased plots was consistently retarded.

Observations on the growth of tops from stunted and normal plants of Co. 421 indicated the probable presence of sugar-cane ratoon stunting virus [35, p. 276 and following abstracts] in Trelawney.

Yates (R. A.). **The germination of Cane cuttings, with special reference to damage caused by hot water treatment.**—*Trop. Agriculture, Trin.*, 33, 4, pp. 306–314, 1956.

Sugar-cane pieces of various ages and quality were examined in statistically

planned trials by Bookers Sugar Estates, Georgetown, British Guiana, for capacity to germinate in moist 'bagasse' [milled cane residue] following the long hot water treatment (2 hours at 50° C.) against ratoon stunting [35, p. 720; cf. 36, p. 62 and following abstracts]. The treatment caused a severe reduction in the germination capacity of inferior canes. Material for the treatment should be taken from good stands having canes of uniformly large diameter, and cut before the basal eyes have hardened. Mature eyes that are beginning to swell germinate poorly.

Diseases.—*Rep. Hawaiian Sug. Exp. Sta., 1956*, pp. 23–27, 4 figs., 1956.

It is stated in this report [cf. 35, p. 845] that ratoon stunting of sugar-cane was not widespread in the period 1st October, 1955, to 30th September, 1956, and was better controlled by treatment of cuttings for eight hours in hot air at 54° C. than for 2 hours in water at 50°, the latter being more harmful to germination [cf. preceding abstract]. Inoculating cuttings of 38–2915, already infected by chlorotic streak, with ratoon stunting virus resulted in severely retarded cane growth compared with cuttings affected by chlorotic streak alone or from healthy plants. Severe losses may be expected when cane is simultaneously affected by the two diseases. In resistance trials at Waipio most of the 61 varieties inoculated with ratoon stunting virus developed internal symptoms, the lowest percentages of affected stalks occurring in 39–7028 (3 per cent.), 51–1016 (10), 48–4646 (11), Ramu *Saccharum robustum* (11), 48–3649 (13), 48–2094 (14), and Burma *S. spontaneum* (14). Of the knife disinfectants used in 1955 and 1956, lysol (5 per cent. and over), bionol, wescodyne, and phenyl mercuric acetate (PMA), all at 5 per cent., and isopropyl alcohol (50) gave good control and could replace chlorox, which has a corrosive effect on the knife. Ratoon stunting was not transmitted by contaminated knives after 24 hours.

No symptoms developed on healthy plants in water cultures in which plants with chlorotic streak had previously been grown. Cuttings severely affected by chlorotic streak had poorer germination and subsequent growth than the healthy ones.

Red rot [*Glomerella tucumanensis*: 34, p. 676] was again serious on the variety 38–2915; in areas where it is a problem the more resistant 39–7028 should be grown.

Pythium root rot of cane seedlings [cf. 34, pp. 676, 772] in flats was effectively controlled by applications of captan (2 gm. per flat) as a soil drench at weekly intervals during wet weather and every two to three weeks in drier conditions.

Antoine (R.). **Observations on Sugar Cane diseases in Australia and Fiji.**—*Bull. Mauritius Sug. Ind. Res. Inst.* 5, 52 pp., 2 figs., 6 diags., 1 graph, 2 maps, 1955.

Most of the information contained in this bulletin on sugar-cane diseases of Australia and Fiji and on the work done in these countries and in Mauritius to control or eliminate them has already been noticed from other sources [34, p. 675; 35, pp. 634, 791; 36, p. 2, and following abstracts].

Hughes (C. G.). **Recent developments in the study of ratoon stunting disease.**—*Proc. Qd Soc. Sug. Cane Technol., 1955*, pp. 107–110, 1955.

In this review of recent studies on ratoon stunting disease of sugar-cane in Queensland [35, p. 845 and following abstracts] it is stated that when examining a plant stool it is necessary to section only the primary shoot, as the disease does not normally appear in secondary or later shoots. A wide range of chemicals was tested as inactivators of the virus in aretan solutions used in the spray attachments to the cutter planter [? against *Ceratocystis paradoxa*: 35, p. 235]. In the circulating type of planter contamination of these solutions could lead to marked increase in

ratoon stunting in plants taken from blocks having only an occasional diseased stool. Zephiran was satisfactory but caused foaming; it is suggested that the solution should be allowed to run to waste after spraying rather than be recovered for further use.

STEINDL (D. R. L.). **Ratoon stunting disease yield trials.**—*Cane Gr. quart. Bull.*, 20, 2, pp. 57–60, 1956.

Further experiments on the effect of ratoon stunting virus on yields of sugar-cane in Queensland [see preceding and next abstracts] showed that losses, though smaller than in Q.28, were serious in several of the more important commercial varieties and would have been considerably more so in a dry year. In plant crops Trojan had the highest average loss (9·7 per cent. for 15 trials, reaching 25·2 per cent. in one), followed by Pindar (9·3 per cent. for 14 trials, highest 22·9 per cent.); substantial losses in individual trials occurred in N.Co. 310 (18·5), P.O.J. 2878 (14·5), Q. 47 (17·7), and S.J. 4 (31·7). In ratoons losses averaged 25·5 per cent. for five trials (highest 51·5) with Trojan, 19·15 per cent. for four trials (26·65) with Pindar, and 21·9 per cent. with Vidar. Q. 50 continued to show a high degree of tolerance.

MUNGOMERY (R. W.). **Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* 56, pp. 68–89, 16 figs., 1956.

In the disease section (pp. 81–89) of this report [cf. 35, p. 327] C. G. Hughes states that in investigations on the control of sugar cane ratoon stunting virus [see preceding abstracts] some of the setts receiving hot-water treatment (50° C. for three hours) in the winter germinated poorly or not at all but germination of cane treated in the spring and planted under good conditions was satisfactory. The number of primary shoots showing immature symptoms reached a maximum in inoculated setts 29 weeks after planting, when the average stem length was 7·6 in. Some plants, though infected, failed to develop such symptoms.

Chlorotic streak virus was reported for the first time from Bundaberg, Isis, and Giru. Rind disease (*Pleocyta sacchari*) [29, p. 332] was present in many stalks damaged by cyclones and was suspected in some living canes.

Sclerophthora disease [*Sclerospora macrospora*: 35, p. 328] affected up to 60 per cent. of the stools in the Proserpine district, the infection being the heaviest ever recorded in Queensland on a farm scale. Oospores of the fungus were found in and near the affected cane fields in Para grass (*Brachiaria mutica*) and in an unidentified grass resembling *Axonopus compressus*.

HUGHES (C. G.). **Leaf-scald disease and Q.57.**—*Cane Gr. quart. Bull.*, 20, 2, pp. 69–71, 2 figs., 1956.

Leaf scald [*Xanthomonas albilineans*] of sugar-cane [35, p. 328], the most important bacterial disease in commercial fields in Queensland, may be present without causing typical symptoms until there is a check in the growth of the crop caused by sudden dry weather or other factors. This is a major obstacle in controlling the disease.

At the Pathology Farm, Eight Mile Plains, the difficulties of obtaining good sett inoculation unless the plants are grown in localities where the disease occurs naturally were overcome by inoculating the freshly cut stubble surface. Following this method standard varieties gave reactions which paralleled their known reaction in the field. The field reaction of Q.57 is still unknown, but from trial results it is expected to behave like Trojan [34, p. 630], i.e., it will be seriously affected only if diseased setts are used or if the knife is contaminated. Inoculation of young stubble of Q.57 resulted in 80 per cent. infection; symptoms disappeared, however, within two months of cutting.

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